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June 1948

Chemical Industries

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INSECTICIDES AND FERTILIZERS SWING TO SYNTHETIC COMPOUNDS

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Unvarying Quality

- Soda Ash
- Chlorine
- Caustic Soda
- Sodium Nitrite
- Caustic Potash
- Calcium Chloride
- Specialty Cleansers
- Sodium Bicarbonate
- Ammonium Chloride
- Potassium Carbonate
- Para-dichlorobenzene
- Ammonium Bicarbonate

In the course of the 67 years since SOLVAY was established, we have never deviated from our original policy of producing chemicals of unvarying high quality. It is this consistently uniform high quality which has kept SOLVAY the leader in the field over a period of more than two generations.

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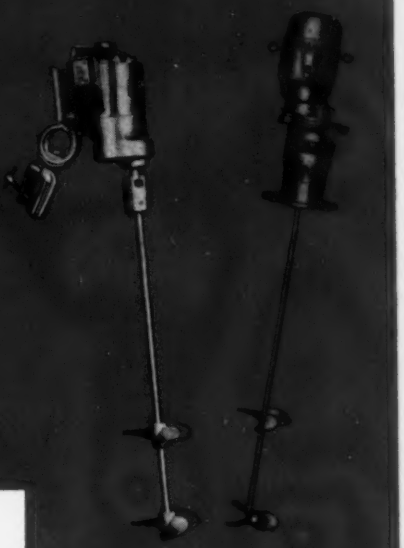


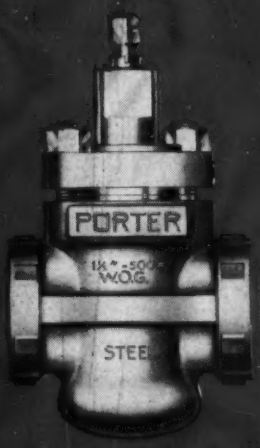
PORTER High Efficiency Ball Mill

*Engineered FOR OVER-ALL ECONOMY

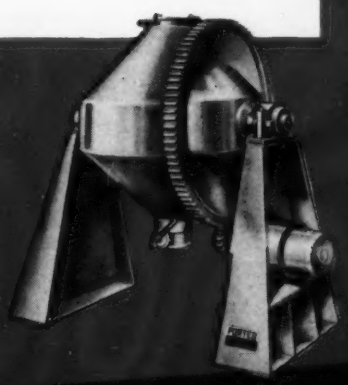
Porter Standardized Process Equipment gives you more value for your money because our standard designs enable us to build better equipment for less money. Besides, ready availability of interchangeable parts enables you to maintain your equipment at less cost. As each Porter design is engineered to do a specific job and made in a wide range of sizes, you can select a unit exactly fitted to your needs. Start now to economize by specifying Porter Standardized Equipment for all new or replacement installations.

PORTER Liquid Mixers—Side Entering, Top Entering, Portable

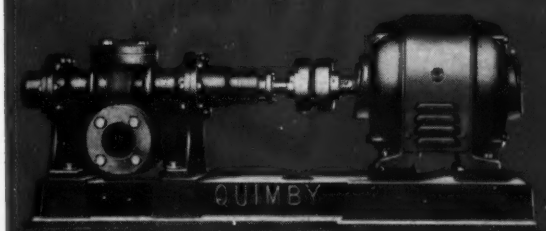
PORTER Double-Ribbon Mixers for Heavy Duty Operations



PORTER Lubricated Plug Valve



PORTER Double-Cone Blender for Rapid Blending of Powders, Crystals, Etc.



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The Mathieson Alkali Works (Inc.)
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Established in 1892 for the manufacture of alkalies, the original company has since broadened its scope of activities to include other chemicals and related specialties. The new name more adequately describes the wider field of operations in which Mathieson is now engaged. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.
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Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 62—NUMBER 6 JUNE, 1948

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Westvaco Expands
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Cover: Woburn Chemical Corp. (N. J.)

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Published monthly at 1309 Noble St., Philadelphia 23, Pa., and entered as 2nd class matter July 15, 1944, at the Post Office at Philadelphia 4, Pa., under the Act of March 3, 1879. Subscription $5 a year, $8 for two years, $10 for 3 years. Add $2 per year for postage to Latin America. Other foreign rates, except Canada, $15 one year, $30 for 3 years. Single copies 60c, except special issues. Canadian subscriptions and remittances may be sent in Canadian funds to Chemical Industries, P. O. Box 100, Terminal A, Toronto, Canada. Copyrighted 1948 by MACLEAN-HUNTER Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y., Murray Hill 2-7888. Horace T. Hunter, President; E. R. Gauley, Vice-President and General Manager; J. L. Frazier, Secretary. OFFICE OF PUBLICATION: 1309 Noble Street, Philadelphia 23, Pa. EDITORIAL & EXECUTIVE OFFICES: 522 Fifth Ave., New York 18, Murray Hill 2-7888. DISTRICT OFFICES: Chicago: 309 West Jackson Boulevard, Chicago 6, Ill., Harrison 7890. Los Angeles: 1709 W. 8th St., Los Angeles 14, Calif., Fa-8576. San Francisco: 68 Post St., San Francisco 4, Calif., Yukon 1069. London: Sun Life of Canada Bldg., Trafalgar Square, London, S. W. 1, England.

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THE READER WRITES

Alcohol Is Solution To Fuel Problem

To the Editor of Chemical Industries:

Have just received the February issue of Chemical Industries and note your editorial on the Krug proposal to Congress; also, skit on synthetic fuels on page 223, all of which brings to mind that generally only one side of this tremendous problem is ever presented, namely the petroleum side.

I recently sent one of your contemporaries a couple of pages of data based on organic chemistry which definitely ignores any future for petroleum and shale oil, and even of coal, but gives its direction entirely to fermentation alcohol, the only correct solution for synthetic fuels.

I thought it might be worthwhile for your readers to be informed likewise on the truly chemical aspects of this problem.

WILLIAM J. HALE, President
National Agrol Co.
Washington, D. C.

The Cancer of Profiteering

To the Editor of Chemical Industries:

Your editorial "Profiteering in Chemicals" appearing in the January issue of Chemical Industries is very much appreciated. Profiteering is now probably going rampant all over the world and your country being the leading producers in the present world market should give a lead in the right direction so that the cancer of profiteering is checked. The lead given by Calco Chemical Division of American Cyanamid Co. and the National Lead Co., as mentioned in the said editorial are commendable. The comments in your "What's New" section of the journal regarding the industrial expansion and resources of Travancore in this new Dominion indicate how much America is interested in establishing business relationship with India.

K. P. GHODI
India Alkalies Ltd.
Calcutta, India

Likes Division of News, Recommends for Ads

To the Editor of Chemical Industries:

Congratulations on separating your "Personnel" section into divisions. I have often hoped that all advertising could be segregated according to its content: equipment and chemicals, at least. Contact between the advertisement and interested party would certainly be expedited.

TROWBRIDGE KENNEDY
Firestone Plastics Co.
Pottstown, Pa.

2,4-D Story Reprinted for Rice and Cane Growers

To the Editor of Chemical Industries:

Thank you for permission to reprint the article "Liquid Killer", which was published in your February issue. We intend distributing this reprint to county agents and other interested people throughout the rice and cane areas of the Gulf Coast. It is an excellent informational article and will be used as reprinted for that purpose.

W. A. YODER
Beaumont Cement Sales Co.
Beaumont, Texas

Asking for Trouble

To the Editor of Chemical Industries:

On page 53 of your January 1948 issue is a picture of a man adjusting an air agitator on a sulfuric acid dilution tank.

The man is wearing neither goggles nor rubber gloves, and absolutely no protection is afforded him in case a surge of air should cause a splash of acid.

If the chemical industry is to improve its present "just above average" safety position, such foolhardy practices must be stopped. As a member of the Alpha Chi Sigma Fraternity National Safety Committee, I am writing to ask where the picture was taken, in order that the gentleman may be warned in time to save him from serious injury or death. Our profession must become more active in accident-prevention work if we are to improve our status and prevent loss of manpower through accidents.

HOWARD FAWCETT
New Castle, Delaware

Kudos for Petrochems

To the Editor of Chemical Industries:

I wish to congratulate you on the article in the March issue by Mr. Zabel entitled "What's Ahead for Petrochemicals?" This article reveals a good deal of careful study and, in my opinion, very excellent judgment.

BENJAMIN T. BROOKS
New York, N. Y

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Chromium compounds find one of their most important applications in pigments for the paint, printing ink and ceramic industries. For over a century Mutual Chromium Chemicals have been used in virtually all brilliant, resistant yellows, greens and oranges. Many bright reds with high covering power are also produced from Chromium Chemicals. Permanent blues, while not yet commercially available, may also be made.

Chrome yellows are available in a wide variety of shades ranging from the palest canary to deep chrome orange, and constitute a large percentage of the yellow pigments used industrially.

The most stable green known is Chromic Oxide (Cr_2O_3) which is unaffected by strong alkalies, mineral acids or hydrogen sulphide, while the brightest sunlight and high temperatures have no effect on it. Hydrated Chrome Oxide (Guignet green) is noted for a brilliant emerald shade of great beauty.

The green shutters that dot the countryside and the bright yellow bowls of grandma's kitchen have been followed by permanent green granules for roofing and the contrasting yellow signs on our highways . . . all from Chrome pigments.

Mutual's plants in Baltimore and Jersey City, supplemented by dealers' warehouse stocks, are serving the leading pigment manufacturers of the United States and Canada.

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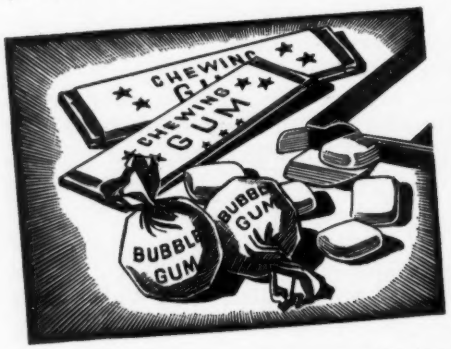
CHROMIUM CHEMICALS

HOW HERCULES *Creative Chemistry*

SYNTHETIC RESINS TO FIT INDUSTRY'S MANY NEEDS

Good backsizing adds many characteristics of expensive rugs to low cost axminsters. Rug sizes, modified with Hercules Flexalyn* Resins, are tough, leathery, flexible. The Flexalyns bind tufts into the fabric. They add bulk, help axminsters lie flat, minimize wrinkling in service. Flexalyn-starch sizing mixtures are flexible. The Flexalyns are also important components in the production of industrial textile coatings, paper coatings and sizings, wallboard coatings, lacquers, casein and Parlon* (Hercules Chlorinated Rubber) paints.

In the making of all types of chewing gum, Staybelite* Esters, another group of Hercules Synthetic Resins, help to give bulk and "chew" to the product. They have wide compatibility with resins, waxes, plasticizers, and film-formers. In addition to being an important chewing gum ingredient, Staybelite Esters serve as tackifiers in pressure-sensitive adhesives, as transparentizing agents for paper, and plasticizing resins for lacquers.



The Flooring Industry is one of the many industries using Hercules Synthetic Resins. One of these resins, Hercolyn*, acts as a softener and plasticizer in asphalt and plastic tile.

Many other Hercules Synthetic Resins are working for industry. The Pentalyns* improve the durability of paints and varnishes. The Neolyns* modify vinyl plastics. Petrex* Resins help in the making of aniline printing inks. The Cellolyns* improve the resistance of nitrocellulose lacquers to sunlight, low temperatures, and alcohol.

HELPS THE PROCESS INDUSTRIES (No. 6 of a Series)

"New Look" on Packages

Paperboard treated with Hercules* CMC has the "new look." CMC gives paperboard added resistance to penetration of oils, waxes, and ink, which means higher quality gloss ink printing and a saving in ink and wax. CMC (sodium carboxymethylcellulose) may be used separately or in conjunction with conventional paper surface treating materials such as starch, wax, and wax-resin emulsions.

Pine Oil Digs In, Saves Soap

One of the many applications for Hercules Yarmor* is in the wet processing of textiles. This top-quality pine oil is used by textile mills to wet out fibers thoroughly, rinse them clean, save soap and money. In industry, pine oil quickly removes dirt—grease—grime. Yarmor is also used in laundry detergents, metal cleaning compounds, disinfectants, paper coatings, paint and varnish solvents.

This Data May Help You

Hercules Dresinates*, a group of saponified rosin products, serve many industrial needs. They are characterized by high uniformity, easy handling. Low in cost, they are available in dry, paste and liquid form. Dry Dresinates act as detergent, wetting, emulsifying and suspending agents in alkaline cleaners. Paste Dresinates are used in adhesives, coating compositions and soaps. Liquid Dresinates are emulsifying and stabilizing agents for soluble oils, disinfectants, and solvent cleaners.

HERCULES

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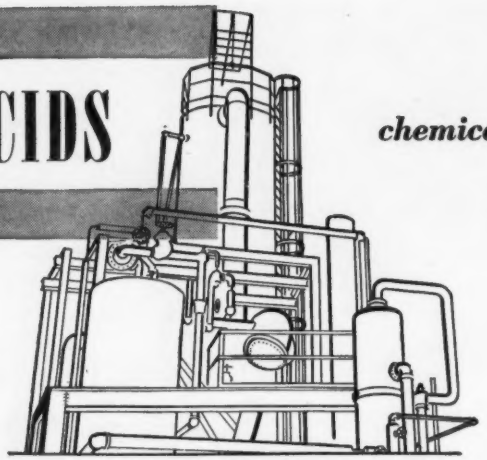
FATTY ACIDS

chemical data . . . product data . . . use data



fractional distillation

THE SOURCE OF NEW PRODUCTS

Armour's patented fractional distillation process is not only the key to improved products but also the source of new products. This remarkable process separates crude mixed fatty acids into their pure component acids and makes available to industry fatty acids and fatty acid derivatives (such as amines, amides, nitriles and quaternary ammonium salts) which existed previously only as laboratory curiosities.

This means that the manufacturer can now select the specific fatty acid desired for his particular product instead of just taking the mixed fatty acid containing the highest percentage of the individual acid desired.

The Neo-Fats (trade name for Armour's fractionally distilled fatty acids) are already being used in chemicals and cosmetics, candles and chewing gums, soaps and flotation reagents, rubber tires and typewriter ribbons, plastics and shoe polishes, insecticides and lubricating greases, varnishes and recording cylinders. But these uses are just an indication of the Neo-Fats' contribution to industry today, for the separation of these commercially pure fatty acids gives the industrial chemist vast new fields to explore.

FATTY RADICAL A MAJOR FACTOR IN METALLIC SOAPS

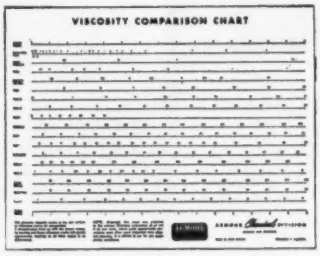
It is now recognized that the physical and chemical properties of metallic soaps, which at one time were attributed largely to the influences of the metallic ion, are fully as dependent upon the fatty radical employed.

In the lubricating field particularly, great stress is laid upon the composition of fatty acids, since grease yields (which are dependent upon thickening power, temperature tolerances and mechanical stability) have been correlated definitely with fatty acid composition.

Stearic, palmitic, myristic and lauric acids each impart specific properties to their aluminum, magnesium, lithium and other water insoluble salts, as well as to their water soluble sodium and potassium salts. Controlled mixtures of the above, as well as mixtures containing arachidic and behenic acids often increase mechanical stability and widen temperature tolerances, although softening points are usually lowered.

During the war the intensive research in this field in developing suitable thickening agents for incendiary weapons greatly increased our appreciation of the influence of the fatty radical in metallic soaps.

FREE VISCOSITY COMPARISON CHART



This chart showing all major viscosity scales enables you to make a quick comparison of a known reading on one scale with its corresponding reading on any or all of the other 17 scales.

ADDITION OF AMINE ACETATE IMPROVES WET-SURFACE PAINTS

Armac C (Armour's coco amine acetate) has the ability to make oils preferentially coat many damp surfaces, forcing the water away from the surface and making a direct "oil-to-surface" bond.

Investigation of this property in connection with paints shows that 0.5% Armac C (on the basis of the solids) is sufficient to cause the paint to cling better to damp, rusty surfaces. Generally the Armac C is added in butanol solution when the solvent is added to thin the mix.

Work done on pure phenolic varnishes shows that the addition of 0.5% Armac C also acts as an anti-skinning agent without affecting the drying rate.

WRITE FOR "THE HANDLING, SAMPLING AND TESTING OF FATTY ACIDS"

This concise, authoritative booklet is available without charge. The following subjects are covered: Shipping fatty acids; storing fatty acids; process equipment; standard sampling methods and equipment; testing fatty acids; tests commonly used and their meanings.

FROTH FLOTATION OF MINERALS

Selective separation of minerals by froth flotation is dependent on that property of mineral matter which makes it possible to selectively wet or film mineral surfaces. Fatty acids produce a hydrophobic film—a surface which is non-wettable by the liquid in which the mineral particles are suspended.

PRODUCT SPECIFICATIONS

	Titer	*Acid V.*	*Iodine V.*
Neo-Fat 1-65	67°C	198	3.0
Neo-Fat 1-60	61°C	202	3.5
Neo-Fat 3	23°C	198	120
Neo-Fat 3-R	19°C	198	140

Unlike ordinary "double-pressed" stearic acid, which actually contains less than 50% stearic acid, the fractionally distilled Neo-Fats 1-65 and 1-60 contain respectively 90% and 75% stearic acid. As a result, it is frequently possible to use smaller percentages of these Neo-Fats formulations where commercial stearic acid has previously been used. Uses include: rubber compounding, metallic soaps, buffing compounds, paper coatings, greases, shave creams, cosmetics, pharmaceuticals.

Neo-Fats 3 and 3-R are carefully controlled, uniform mixtures of C-18 acids, predominantly unsaturated. Neo-Fat 3 (50% linoleic, 40% oleic, 10% saturated) is a mixture particularly suited to the production of potash jell soaps, textile soaps, special lubricants, etc. Neo-Fat 3-R (59% linoleic, 39.5% oleic, 1.5% saturated) with its high linoleic content and freedom from linolenic is ideally suited to the manufacture of alkyd resins for non-yellowing enamels and varnishes, and is also excellent for emulsions, paper sizing compounds, etc.

* * *

A new coconut oil fatty acid mixture is now available. It's ideal for shampoos, shaving creams, toilet preparations, specialty soaps, since it is stripped free of irritating short-chain acids. Average composition: Myristic, 45%; Palmitic, 25%; Lauric, 15%; Stearic, 15%. Titer, 42°C; Acid Value, 230; Iodine Value, 5 Max.

The first fatty acids used for froth flotation were of necessity cheap and crude ones. Many flotation processes were developed for use of crude fatty acids, but whenever a high degree of selectivity is desired, refined and consistently uniform fatty acids are required, such as Neo-Fats 3, 3-R, S-142, D-142, 17 and low-titered vegetable oil fatty acids of high oleic-linoleic acid content. Titer is important since dispersion of the fatty acids in water is essential—a difficult procedure when you consider that often only one-half pound of a fatty acid is dispersed in 10,000 pounds of water to film and float to the water surface 1,700 pounds of mineral having an apparent surface area of 1,500 sq. cm/gm.

The Armacs (amine acetates) and the Arquads (quaternary ammonium salts) are also widely used as flotation reagents.

Individual Data Sheets are available on each of the fatty acid products mentioned on this page. Indicate on coupon below any specific sheets you would like to have.

Mail this coupon today

(*Attach to your business letterhead, please*)

Please send me, without charge, items checked below.

- ☐ Viscosity Chart
- ☐ Booklet, "The Handling, Sampling and Testing of Fatty Acids
- ☐ Individual Data Sheets on.....

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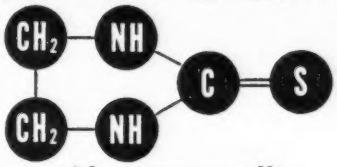

Ethylene Thiourea forms complexes with many metallic salts. Most of the reactions of Ethylene Thiourea involve its tautomeric isothiourea form. It may also be acylated with acid chlorides, and methylol derivatives are obtained by its reaction with formaldehyde.

SUGGESTED USES:

Intermediate for Organic Synthesis
Anti-Oxidant

PROPERTIES:

Appearance	Fine white to pale green crystals.
Odor	Slight.
Ethylene Thiourea content	Min. 97.5%
Volatiles	Max. 0.3%
Melting Point	Min. 191°C.

DIALKYLTHIOUREAS

1,3-Diethylthiourea
1,3-Diisopropylthiourea
1,3-Dibutylthiourea

SUGGESTED USES:

CORROSION INHIBITORS
PICKLING INHIBITORS

These materials have found application as components of dry pickling and cleaning compositions containing acidic materials, such as sodium acid sulfate.

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DIETHYLAMINE DIBUTYLAMINE
TRIETHYLAMINE TRIBUTYLAMINE
DIETHYLAMINOETHANOL TETRAETHYLTHIURAM DISULFIDE
ETHYLETHANOLAMINES 161 TETRAETHYLTHIURAM MONOSULFIDE
DI-sec-AMYLPHENOL TETRAMETHYLTHIURAM DISULFIDE
ZINC DIETHYLDITHIOCARBAMATE
ZINC DIMETHYLDITHIOCARBAMATE
ZINC DIBUTYLDITHIOCARBAMATE
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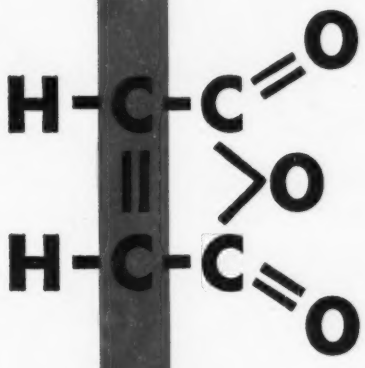
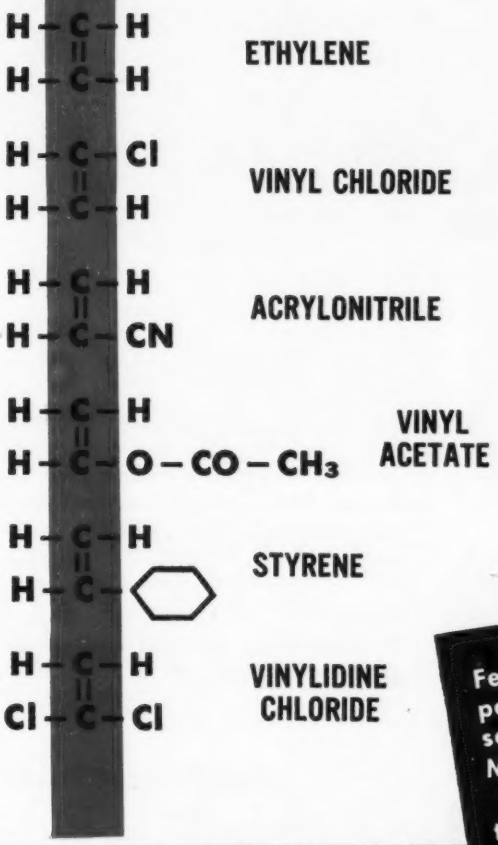
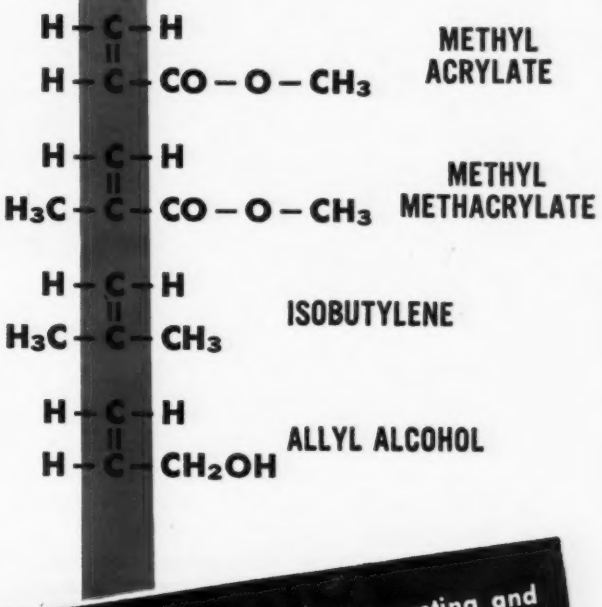
adventures in synthesis

BASED ON THE ETHYLENIC DOUBLE-BOND IN MALEIC (TOXILIC) ANHYDRIDE



MALEIC ANHYDRIDE





Few chemical structures offer as interesting and potentially-profitable opportunities for creative research as the reactive Ethylenic Double-Bond in MALEIC (TOXILIC) ANHYDRIDE.

While many useful products are now based on this low-priced organic and its primary reaction compounds, its possibilities are far from being fully explored. We welcome inquiries that may develop new applications for this versatile chemical.

National Aniline

DIVISION OF

ALLIED CHEMICAL & DYE CORPORATION 40 RECTOR STREET, NEW YORK 6, N. Y.

America's Leading Producer of
MALEIC ANHYDRIDE

We like to think that many people are familiar with Nuchar Activated Carbon, but we'll have to admit our youngest customer has never even heard of it. This customer, however, does know that it's fun to have his mother rub him with that nice, clear baby oil—oil that has had color and other impurities removed with Nuchar Activated Carbon.

Pharmaceutical firms realize that nothing is too good for this young man and have therefore widely adopted the use of Nuchar to give him that greater purity which is so desirable.

Nuchar's unique ability to remove unwanted impurities, or to 'fence in' the desirable part of a product and let the rest pass through, makes it a double-edged aid to many processes.

New applications are constantly being found. There may be one in *your* operation. An experienced Nuchar technician will be glad to assist you in determining the 'optimum conditions for purification' of *your* product. He can help you make the proper selection of the type of solvent, pH, time and temperature of treatment, and the proper quality of Nuchar to be used.

You owe it to yourself and your product to investigate the possibilities of *versatile* Nuchar Activated Carbon.

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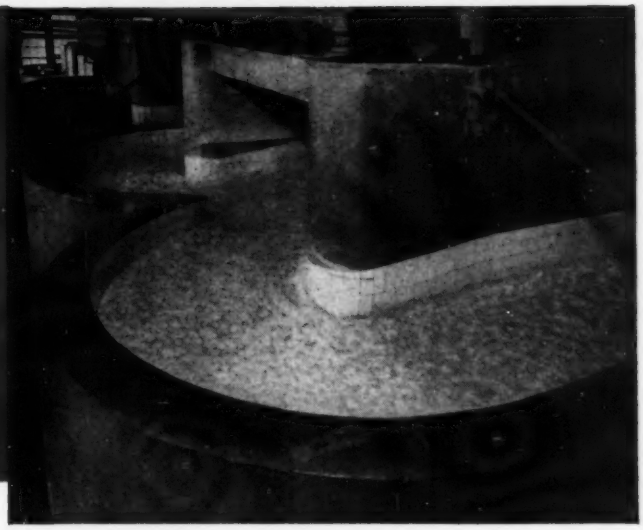
HOW CAN ISCO PRODUCTS WORK FOR YOU?

In the Chemical and Allied Industries



Chloride of Lime—$CaCl(ClO).4H_2O$. 35-37% Available Chlorine. Has many uses in sanitation, public health and industry. Used for bleaching and processing paper, textiles, in laundry bleaching, wherever sterilization is a problem such as water, dairies, etc., in manufacture of textiles, pulp, paper, chemicals, etc. Above, as used in paper processing.

Sodium Silicofluoride—Na_2SiF_6—White, odorless, amorphous powder. Used in manufacture of porcelain enamels, ceramic glazes, opal glass, artificial marble; ingredient of insecticides; laundry souring agent. Above, as used in porcelain enamels for kitchen cabinets, refrigerators, etc.

Talc—All cosmetic grades of the finest talc available. You benefit from wartime research when you specify Isco Talc. We have retained the same methods of production developed during the war to provide chemically standardized talc of definite particle size and shape.

You'll like ISCOoperation!

When you call on Isco you can be sure of cooperation from the moment you make your inquiry. You'll like ISCO-operation whether it's a problem of replenishing inventories or a problem of the right material for a new product or process. Our technical department will help you solve any problem involving the use of an Isco product.

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Good-rite
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Ethers of Hydroquinone

Monobenzyl Ether of Hydroquinone

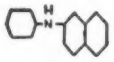
Dibenzyl Ether of Hydroquinone

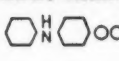
Monobenzyl ether of hydroquinone may be used as an antioxidant, stabilizer, or plasticizer in pharmaceuticals, paints, varnishes, and organic synthesis.

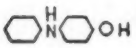
Dibenzyl ether of hydroquinone may be used as a high boiling solvent for perfumes, cosmetics, pharmaceuticals, plasticizers, paints, varnishes, and organic synthesis.

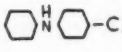
Other organic chemicals

Secondary Aromatic Amines

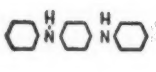

Phenyl B-Naphthylamine

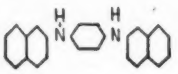

p-Isopropoxy Diphenylamine


p-Hydroxy Diphenylamine

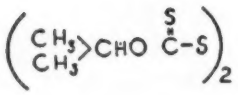

Mixed Mono and Diheptyl Diphenylamines

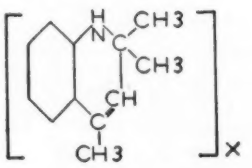
Di-secondary Aromatic Amines

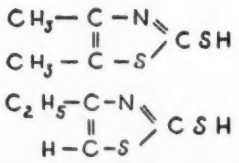

Diphenyl p-Phenylenediamine


Di B-Naphthyl p-Phenylenediamine

Miscellaneous


Di-Isopropyl Dixanthogen


Trimethyl Dihydro Quinoline Polymer


Mixed Ethyl and Dimethyl Mercaptothiazoles

N-Nitroso Diphenylamine

All materials listed here are available in commercial quantities. Prices and technical information are available on request. Please write Dept. CE-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

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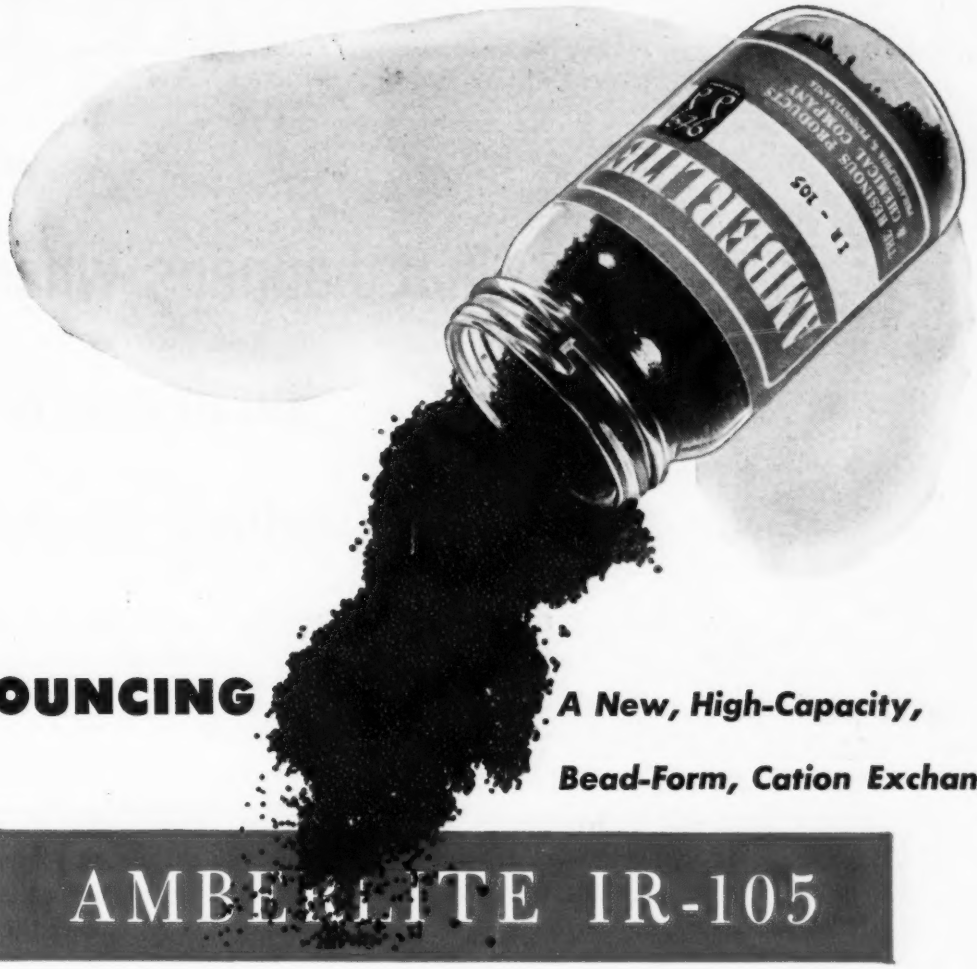


ANNOUNCING *A New, High-Capacity, Bead-Form, Cation Exchanger*

AMBERLITE IR-105

Outgrowth of the development program that has produced AMBERLITES IR-100 and IR-4B, AMBERLITE IR-105 is the newest in our series of cation exchangers.

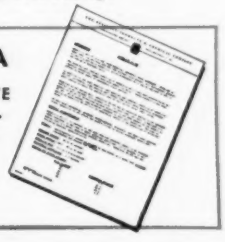
High capacity, physical and chemical stability, freedom from color-throw, and high exchange velocity make this new synthetic resin exchanger particularly suitable for water conditioning and specialty processing. Even aggressive water supplies and solutions high in ionizable solids can be treated effectively due to the high capacity and rugged physical properties of AMBERLITE IR-105. The resin can be employed alone in sodium cycle operation, or in the hydrogen form for deionization with AMBERLITE IR-4B, anion exchanger.

In addition, the bead form of AMBERLITE IR-105 reduces flow resistance, bed channeling, and attrition losses. In salt conversion, exchange chromatography, catalysis, and many other applications, AMBERLITE IR-105 offers new possibilities in cation exchanger operation.

AMBERLITE *is a trade-mark, Reg. U. S. Pat. Off.*

FULL OPERATING DATA

For detailed data on AMBERLITE IR-105, including flow rates, exchange capacity, head loss, regeneration rates and operating rates, write The Resinous Products & Chemical Company today.



THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

What happens when the "push-overs" start pushing back?

ASK ANY GOOD SALESMAN, and he'll tell you that the lush days are just about gone—along with shortages, slow production and the sellers' market.

Today, customers are playing hard to get. The "push-overs" are beginning to push back. Production isn't lagging any more—it's already nearly double the pre-war level, and fast catching up with demand. There's plenty of healthy competition in sight. And you can be glad there is.

American business has always thrived on competition. It still can. But the machinery of selling and distribution will have to work at peak efficiency.

And that means — *more mechanization!*

Mechanization is simply the application of assembly-line methods to the *manufacture of a sale.* It's the only way to balance mass production.

With mechanized selling, you won't turn prospects into "push-overs," but you'll certainly get them leaning your way. By exploring the field, arousing interest, creating a preference for the things your company makes, mechanized selling multiplies the productive capacity of your sales force by the hundreds, or thousands, or by any number your market requires.

But this machine is no stranger to *you.* You know it by its first name—ADVERTISING.

We'd just like to point out that now is the time to put the machine to work, more consistently, more aggressively than ever. And remember that when your advertising goes to work in the right business papers, with their tremendous concentration of hand-picked readers, it becomes *the most efficient machine* you can use for manufacturing sales at a profit.

Just how efficiently does business paper advertising work? If you'd like to see some examples, we'll be glad to send you a recent ABP folder on actual results. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.

CHEMICAL INDUSTRIES

is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared Monthly by U. S. Industrial Chemicals, Inc.*

U.S.I. CHEMICAL NEWS

June ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1948

Superior Tung Oil Vehicles Made Possible With New Hard Resin

A new hard resin with high melting point makes tung oil vehicles that are superior in quality to ester gum types at no extra cost, U.S.I. officials revealed recently. Known as Arochem 351, this resin is said to satisfy an urgent demand, now that the paint industry is again using tung oil varnishes.

Arochem 351 possesses a higher melting point than ester gum and can be used to produce china wood oil varnishes that are characterized by safety in the kettle, good color and high gloss. In addition, it is substantially non-reactive with reactive pigments such as zinc oxide. The new resin is now available in quantity.

SPECIFICATIONS • AROCHEM 351

Melting Point (Mercury Method): 105-115°C.
Acid Value: 10-20
Color (Gardner Stds. '33—50% Solution in M.S.): 8-10
Specific Gravity @ 25°C.: 1.07-1.12

Low-Pressure Aerosol Dispensers Now on Market

Among the newest weapons in man's unremitting war against harmful insects are the low-pressure aerosol dispensers being placed on the market this spring by a number of manufacturers. They are claimed to be extremely effective, easy to operate, and available at moderate cost.

In the development of modern aerosols, U.S.I. has made many vital contributions. The original military aerosol program, for example, was based on the development and production of purified pyrethrum extract by U.S.I.'s subsidiary, Dodge & Olcott. Since then, the insecticide products of D&O are being marketed by the parent organization. And now, nearly all of the new low-pressure aerosols owe their potency and economy to U.S.I.'s Pyrenones.

Methionine Seen As Aid To Liver Disease

Successful treatment of hepatic cirrhosis, a serious liver disease, has been reported with the use of DL-methionine. The report mentions definite clinical improvement of patients upon administration of this amino acid. Histological appearance of liver cells was shown to be changed upon administration of methionine. U.S.I. has increased its production of DL-methionine to meet with the demands of the pharmaceutical and feed industries.

THE AMERICAN HYDROCARBON SYNTHESIS: VI

Coal May Serve As Raw Material For Hydrocarbon Synthesis

Although Processes To Manufacture Synthesis Gas From Coal Are Not Yet Commercial, Continued Progress Is Expected

SIXTH IN A SERIES

This article is the sixth of a series prepared by the editors of *Chemical News* to acquaint the members of the chemical and allied industries with the ABC's of the American Hydrocarbon Synthesis. Last month's article pointed out the advantages of natural gas as a raw material for synthesis gas. There are, however, other materials from which it is possible to produce synthesis gas. The current feature describes the use of one of these — coal.

The only technical essentials for a raw material for the American Hydrocarbon Synthesis is that it contains carbon and can be burned so that partial combustion will produce carbon monoxide. Hydrogen, the other necessary constituent of synthesis gas, may be obtained from steam and other sources.

Since all materials of vegetable origin are carbonaceous, a wide range of materials could theoretically be used. Saw dust, agricultural waste, and refuse conceivably could be used considering only the basic requirement. Commercial considerations eliminate their use in any forseeable future.

5,000 Year Supply of Coal

But there is one carbonaceous material that promises to be important in future hydrocarbon synthesis. That material is coal. It exists in tremendous quantities within our own borders. Few Americans realize the wealth we have in this resource. Well distributed through much of our country, it exists in important fields in more than half of our states. Estimates of deposits above practical mining depths have been made by government agencies and others. One estimate gives as the supply above 3,000 foot depth an excess of three trillion tons.

From this supply we are taking, for all purposes, only about 600 million tons per year. At this rate of use, we have 5,000 years supply of coal, so we can afford to think of processes making new demands on coal for raw material. Suppose only a third of

MORE

Develops Most Precise Standard of Length

Mercury, made from gold in the atomic pile by neutron bombardment, has now been obtained in large enough quantities to perfect methods of measurement by what is alleged to be the most precise standard of length yet devised. The unit is a single wave of green light from an isotope of mercury having an atomic weight of 198 and known as Mercury 198. The discoverers claim that measurement based on this light-wave will make possible length determinations precise to 1 part in 100,000,000—precision in the measurement of length never before attained by man.

ADVERTISEMENT—*This entire page is a paid advertisement*

June ★ **U.S.I. CHEMICAL NEWS** ★ 1948

Alcohol Is Key to New Oil Extraction Process

A new vegetable oil extraction process has been developed with alcohol as the oil solvent. Advantages claimed include: better taste and color of meal; better quality oil; and lower energy requirement from the process. The process requires no distillation to recover the oil or the solvent characteristics of the alcohol. This has been demonstrated by reuse of the solvent more than 85 times. The theoretical energy requirement of the process is about three-fourths that of the hexane process.

In a series of experiments, ethanol, isopropanol, ethylene dichloride, trichloroethylene, carbon tetrachloride, and hexane (b.p. range 30° to 60°C.) were used as solvents for the extraction of soybean oil, and the comparative effect of the solvent on the color and other properties of the oil, meal, and isolated protein was measured. Ethanol extraction gave the best results with respect to the color of oil, meal, and protein, and it also served as a debittering agent for the soybean meal.

Nickel-Plating Achieved Without Electric Current

Nickel and cobalt have been successfully plated on metal surfaces without the use of an electric current by a new process, the inventors claim. The action is said to be brought about by chemical reduction of a nickel or cobalt salt with hypophosphite in hot solution. The coatings which are alleged to be bright and as hard as tool steel may be applied easily to irregular surfaces.

CONTINUED

Hydrocarbon Synthesis

the estimated supply of a trillion tons were available for hydrocarbon synthesis raw material. Based conservatively on one barrel of gasoline per half-ton of coal, this would yield two trillion barrels of gasoline. Currently we use gasoline at the rate of about 650 million barrels per year and an increase of annual consumption to about a billion barrels per year by 1965 has been estimated. On the above basis coal may provide our gasoline for two thousand years even if only one-third of the estimated national resources are employed for hydrocarbon synthesis.

Not Yet Commercial

Processes to manufacture synthesis gas from coal are not yet in operation on a commercial scale. There is, however, widespread developmental interest in such processes. Based on articles in the current technical literature, various private companies are engaged in research programs on coal gasification and the Bureau of Mines is active in its development. Improved efficiencies in gasification are expected from use of powdered coal and work is being done on the underground gasification of coal. If successful, the latter would eliminate expensive mining and handling costs. The great supplies of coal, which give permanence of raw material supply to synthesis of liquid fuel, provides stimulus to development work. We may expect continued progress in the field and a time when liquid fuel from coal is a commercial reality.

U.S.I. has placed itself in the forefront of the hydrocarbon synthesis development by arranging to have available, from plants now under construction, the co-product alcohols, aldehydes, acids and ketones for more diversified service to its customers.

New Book on Process

Synthesis of gasoline from coal or natural gas is described in what is said to be the newest book on the subject published in this country. The authors, B. H. Weil and J. C. Lane, are well-known writers of technical books and articles in the petroleum and related fields.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

Porcelain wallpaper, which can be used in home or industry, is so flexible that it can be rolled into coils with a minimum radius of 6 inches without damage to the material, the makers state. **(No. 327)**

A wrinkle-resistant finish which the manufacturer claims can be successfully applied to all types of cotton with no loss in tensile strength has been announced. Even seersucker when treated with this finish remains fresh after several wearings, company officials state. **(No. 328)**

The first man-made piezo-electric substance, described as a specially-treated ceramic material for converting mechanical energy into electrical impulses, has been announced. **(No. 329)**

Accurate control of low-temperature processing is now said to be made possible by a new instrument which does not come in contact with the materials to be tested. **(No. 330)**

To provide an anti-static surface for plastics, a new synthetic wax has been developed which is said to be incorporated into the molding. **(No. 331)**

A new ultra-violet water sterilizer for domestic and commercial use, said to be particularly applicable to country dwellers, is claimed to provide sterilization equal to U. S. Public Health Standards. **(No. 332)**

A new process control timer can be synchronized with any system of air-operated, semi-automatic temperature and pressure control now in use to make the process fully automatic, the manufacturer states. **(No. 333)**

A new sonic device determines elasticity of fibers, yarns, fabric, plastics, papers and other items, according to the manufacturer. **(No. 334)**

A new-type ultracentrifuge, said to develop speeds up to 20,000 rpm at an air pressure of 80 lbs. per sq. in., is claimed to produce a force of 26,000 times that of gravity. **(No. 335)**

To condition aluminum surfaces, a new product has been announced, which is claimed to prepare any aluminum surface for painting after 5 to 30 seconds. The processing is said to eliminate peeling and chipping. **(No. 336)**

An acid-proof brush, described as soft and pliable when wet, is claimed to be usable on all acids except those effecting glass. **(No. 337)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

ALCOHOLS
Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96% Absolute
*Super Pyro Anti-freeze
*Solox proprietary Solvent

***ANSOLS**
Ansol M
Ansol PR

*Registered Trade Mark

ACETIC ESTERS
Amyl Acetate
Butyl Acetate
Ethyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-anisidide
Acetoacet-ortho-chloranilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloranilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium-Oxalacetate

ETHERS
Ethyl Ether
Ethyl Ether Absolute—A.C.S.

FEED CONCENTRATES
Riboflavin Concentrates *Vacatone 40
*Curbay B-G *Special Liquid Curbay

ACETONE
Chemically Pure

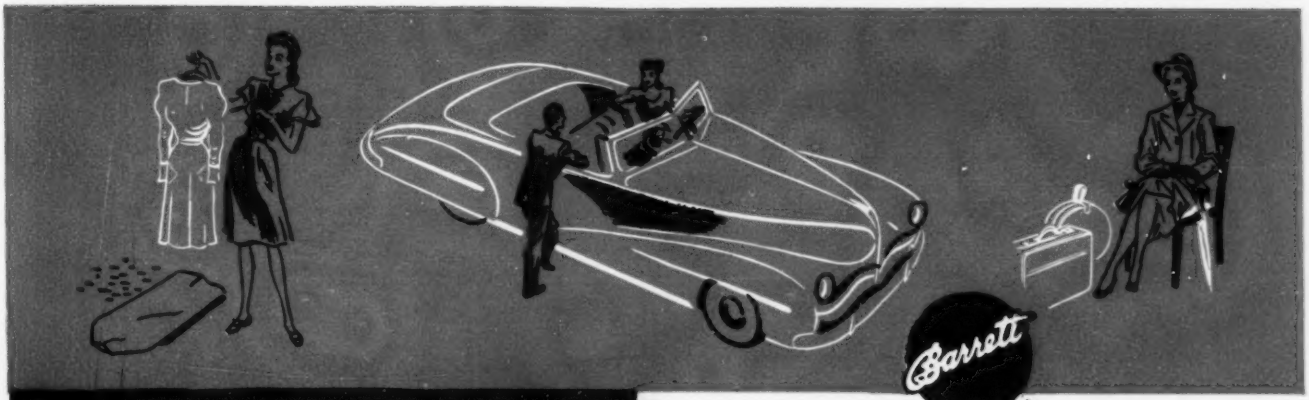
RESINS (Synthetic and Natural)
*Aroplaz—alkyds and allied materials
*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades

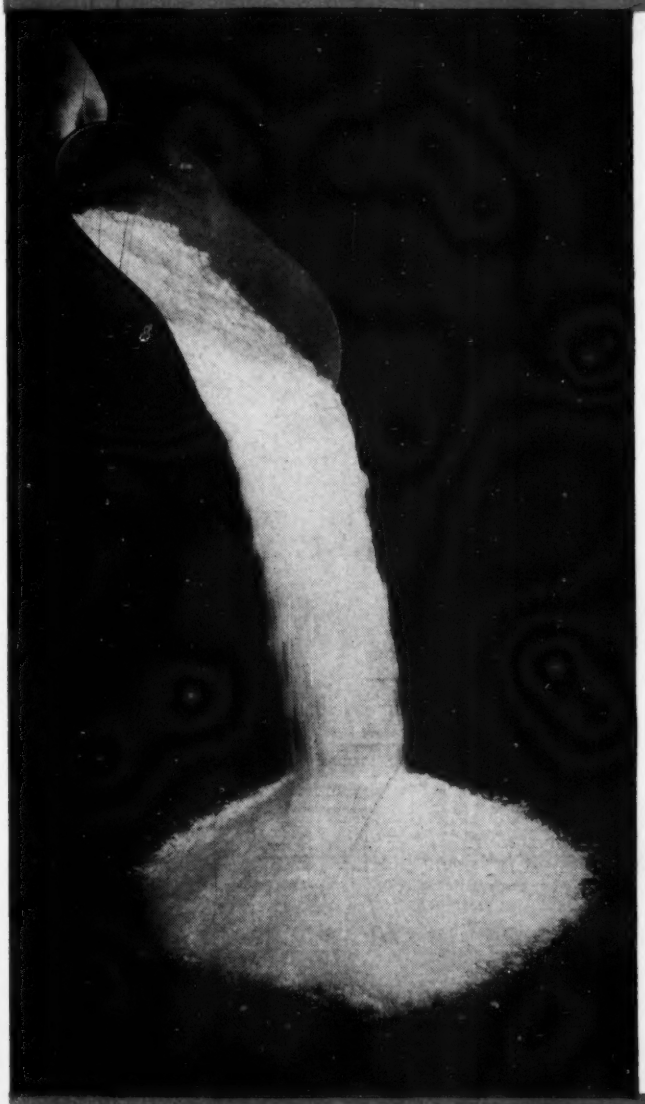
INSECTICIDE MATERIALS
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products

INSECTIFUGE MATERIALS
*Indalone
*Dimelone
Triple-Mix Repellents

OTHER PRODUCTS
Collodions
Ethylene Glycol
Nitrocellulose Solutions
Ethylene Urethan, U.S.P.
DL-Methionine

Printed in U.S.A.





PHTHALIC ANHYDRIDE

Form	Clean, white flakes
Color — Molten	55 Max. (Hazen)
Color — Solid	Pure White
Solidifying Point	130.5° C Min.
Odor	Slight, characteristic
Insoluble in Water	0.01% Max.
Maleic Anhydride	0.40% Max.
Foam Time	18 minutes Min.

Containers: 5-ply Paper Bags—80 lb. net weight.

Barrett* Phthalic Anhydride is of uniform and unsurpassed quality—pure white, free-flowing flakes containing a minimum of fines.

Carefully controlled for freedom from materials which cause premature gelling and excessive foaming, Barrett* Phthalic Anhydride is widely used in the production of alkyd resins for metal finishes, enamels, paints and varnishes.

Phthalic Anhydride is a basic material in the production of phthalic esters for vinyl resins used in the manufacture of upholstery, handbags, luggage, floor tile, raincoats, shower curtains, etc.

The dyestuff industry finds Phthalic Anhydride essential as a basic material in the manufacture of anthraquinone, dyes, phenolphthalein and other synthetic organic chemicals.

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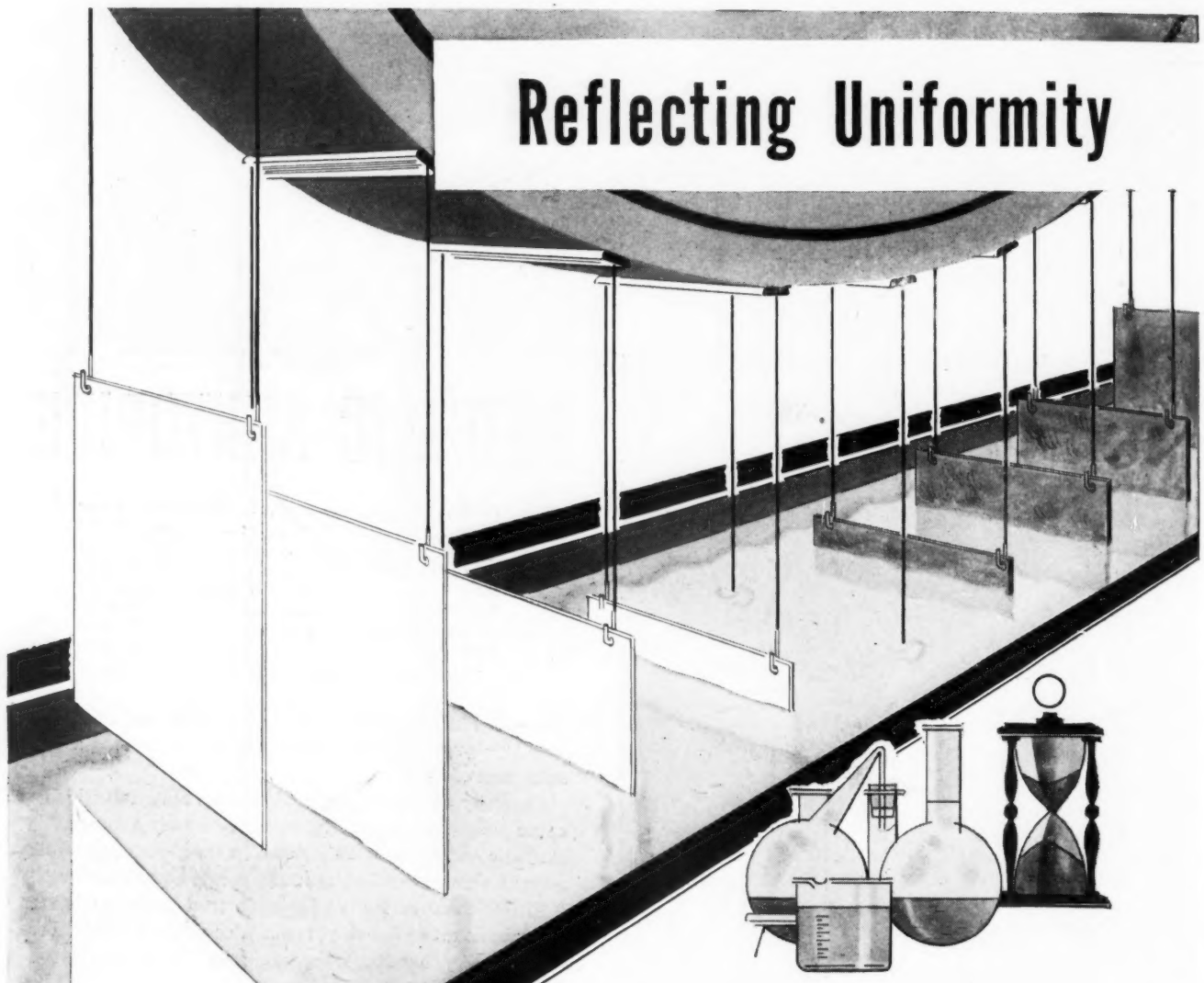

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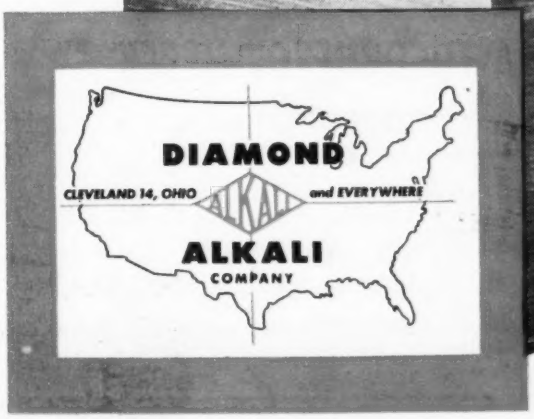
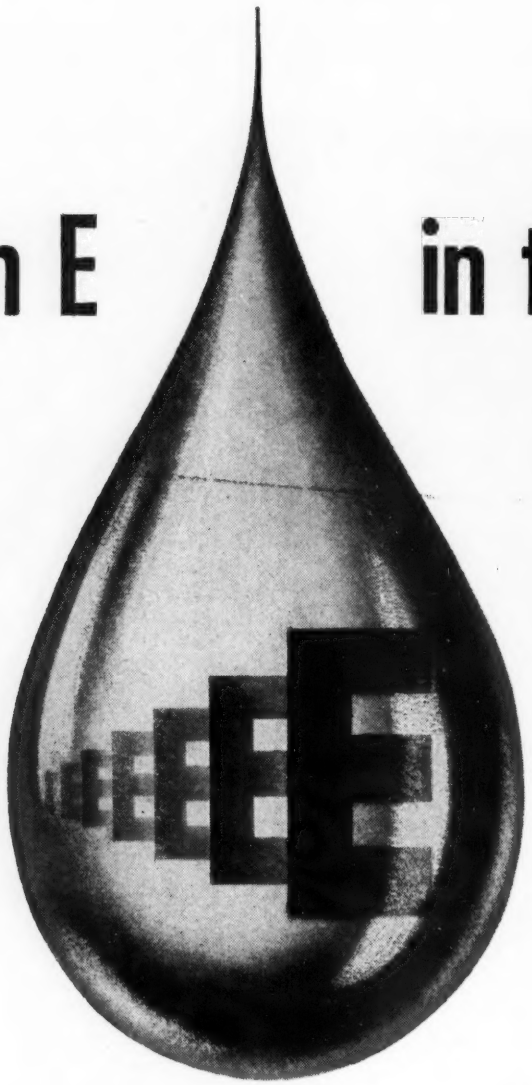
The use of Diamond Chlorowax in the formulation of printing inks is another outstanding example of the success of this resinous chlorinated paraffin, in improving the quality of a wide range of products. Equal success is being experienced by manufacturers of interior and exterior paints, varnishes and lacquers, paper coatings, floor compositions, calking compounds, textile coatings, glues and adhesives, polishes and waxes. Why not investigate the possibilities of using Chlorowax in your formulae. Write today for comprehensive booklet.



* Reg. U. S. Patent Office

Vitamin E in the most acceptable dosage form



Increasing preference for administration of *high dosages* of Vitamin E presents pharmaceutical manufacturers with the important problem of supplying adequately high potencies in conveniently small dosage forms.

ALPHA-TOCOPHEROL MERCK (VITAMIN E) and ALPHA-TOCOPHEROL ACETATE MERCK provide the answer to this problem. By employing these *pure* products, you are assured of high vitamin content in dosage forms most readily acceptable to physician and patient.

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(VITAMIN E)

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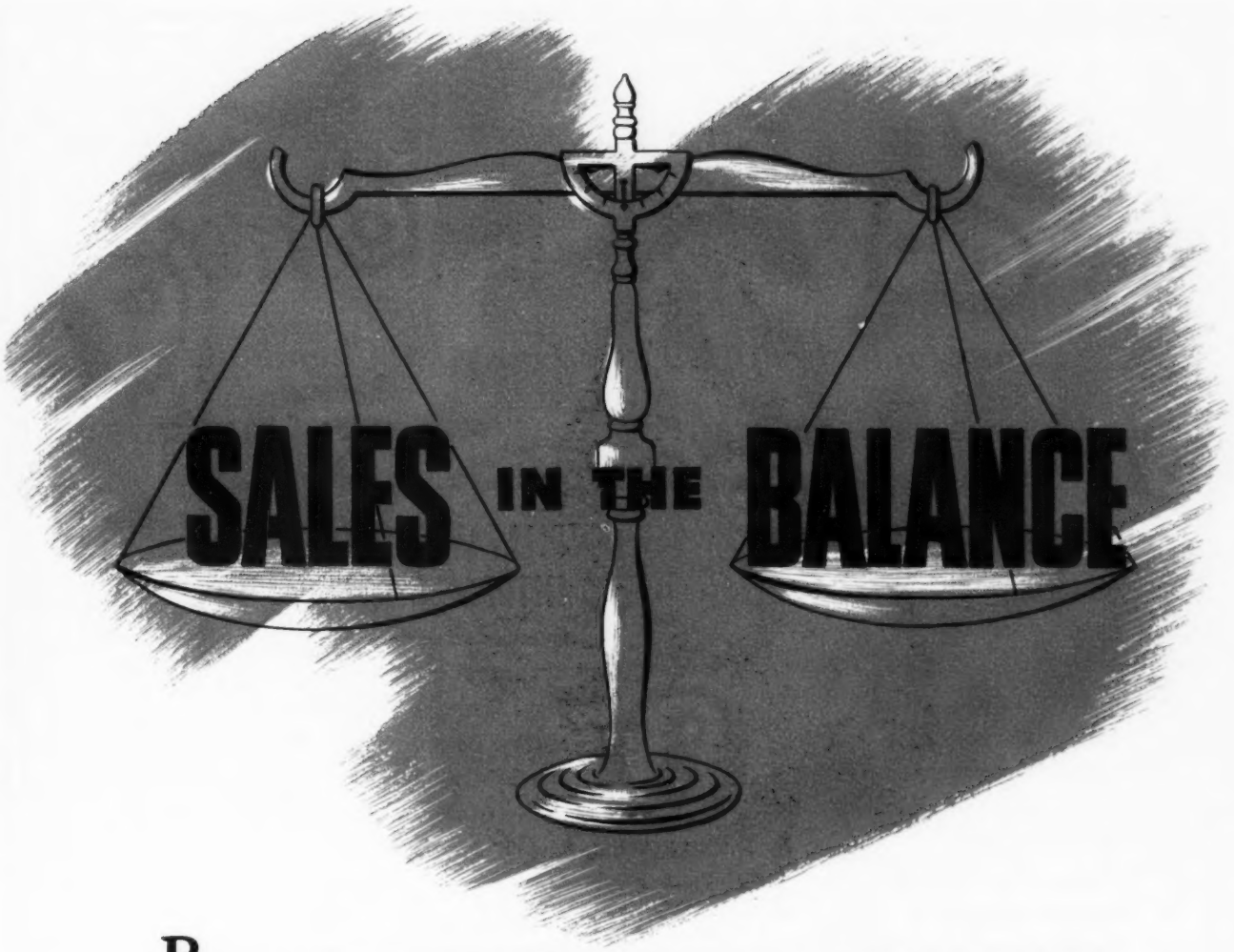
MERCK MERCK



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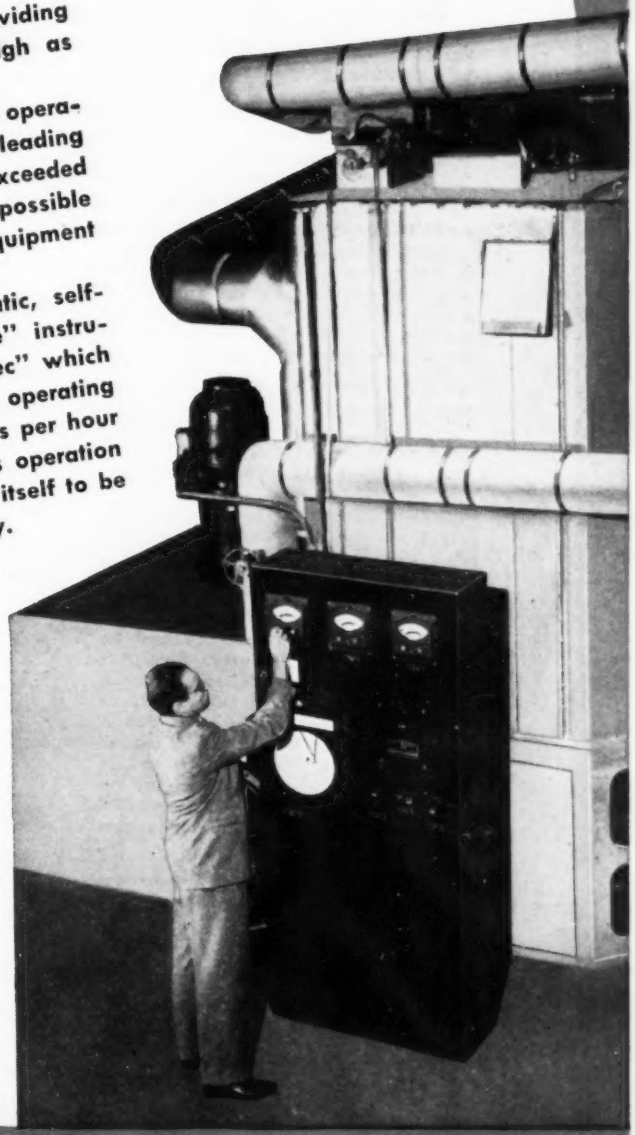

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Efficient boiler operation

Controlled oxygen corrosion

Among the hundreds of Monsanto chemicals for industry, few have more important applications than Santosite (Sodium Sulfite Anhydrous, Technical). Santosite provides operators of large and small boilers with an efficient means of controlling oxygen corrosion... making possible considerable savings in maintenance and replacement costs.

Santosite accomplishes its work economically—by eliminating all traces of residual oxygen in boiler water. It removes the dissolved oxygen by combining with it to form sodium sulfate, which is water-soluble under boiler conditions—and therefore does not contribute to the formation of sludge.

For more detailed information, send for a copy of Monsanto Technical Bulletin O-26, "Santosite for Removing Oxygen for Boiler Feed Water." Ask for it on the coupon if more convenient. *Santosite: Reg. U. S. Pat. Off.*

What is a good germicide?

By definition, a good germicide must be highly effective in killing germs. Santophen 7 not only accomplishes this, but meets many other important practical requirements as well. It is non-staining; can be readily formulated; is effective in the presence of organic matter; is comparatively non-toxic and, in use-dilutions, is non-irritating to man and the higher animals; is general in its germicidal effect (not merely specific toward certain microorganisms).

Reasonable in cost, Santophen 7 possesses other desirable properties, such as faint but pleasing odor, freedom from corrosive action on metals, stability. In addition to meeting the requirements for modern disinfectants, Santophen 7 can also be used to advantage as an industrial preservative and algaecide.

For complete application and technical data, write for a copy of Monsanto Technical Bulletin O-3, "Santophen 7, a Germicide and Industrial Preservative." If you prefer, simply note your request on the coupon. *Santophen: Reg. U. S. Pat. Off.*

NEW DETERGENT *

MXP

* *contains the non-ionic type of surface-active ingredient.*

controlled sudsing—high cleaning action

Developed especially for industrial use, Monsanto MXP is a new scientifically "built" controlled-sudsing detergent containing the non-ionic type of surface-active ingredient. The builders are chosen specifically for their synergistic qualities, which means marked economy in use. MXP also possesses the singular quality of producing relatively little sudsing, while exciting unusually high cleaning action.

MXP is effective over a broad range of solution concentrations, and under many process conditions. Because of its non-ionic nature it does not form insoluble curds in hard water, and is recommended for heavy-duty operations such as metal cleaning, bottle and dairy equipment cleaning, mechanical dishwashing. MXP may be used alone or in combination with other alkalies.

Complete information on MXP is contained in Monsanto Technical Bulletin P-122. For your copy, write to MONSANTO CHEMICAL COMPANY, Phosphate Division, 1703 South Second Street, St. Louis 4, Missouri... or ask for it on the convenient coupon.

STEROX CD

Sterox CD, the 100%-active non-ionic type surface-active agent and detergent, is now available. SUGGESTED USES: Mixed with phosphates, carbonates or silicates, it forms a controlled-sudsing detergent of high efficiency in hard or soft water; emulsion cleaner for metals; emulsifying agent for insecticidal solutions; dispersing agent for insecticidal dusts. Send for Monsanto Technical Bulletin No. P-129 on Sterox CD. *Sterox: Reg. U. S. Pat. Off.*

News of Monsanto Chemicals for the Process Industries . . . . June, 1948

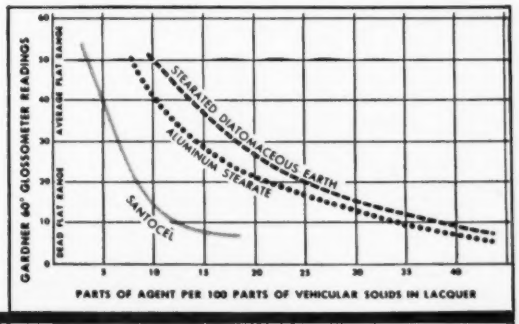
With Santocel C, lacquer manufacturers can now obtain quality matte effects and, at the same time, improve mar-resistance. Along with its high flatting efficiency, Santocel C actually reinforces lacquer films.

Santocel C has negligible effect on film clarity. These outstanding qualities, plus others listed at the right, make Santocel C the ideal flatting agent for protective coatings. If you would like more information, write to MONSANTO CHEMICAL COMPANY, Merrimac Division, Boston 49, Mass.

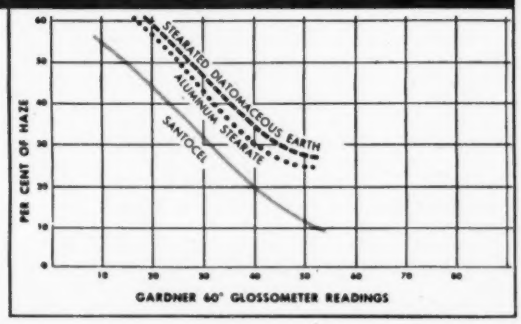
Advantages of Santocel C

1. **Maximum flatting efficiency—three to four times as efficient as other flatting agents.**
2. **Produces a matte finish with negligible effect on film clarity.**
3. **No adverse effects on film properties.**
4. **Improves mar and burnishing resistance.**
5. **Produces hard dry finish.**
6. **Does not "sweat" or "float" to the surface of flexible coatings on drying or distortion of the film.**
7. **Can be used effectively in coatings which are baked at high temperatures or applied hot.** *Santocel: Reg. U.S. Pat. Off.*

Higher flatting efficiency with SANTOCEL C



SANTOCEL C has negligible effect on film clarity



SANTICIZER 160

Heat-stable plasticizer now available in quantity

Now available for immediate shipment in tank car lots, Santicizer 160 can be profitably used in a wide variety of processes. In addition to its value as a heat-stable plasticizer for vinyl sheetings, extrusions, tubings and floor tiles, Santicizer 160 has properties of interest to manufacturers of adhesives, nitrocellulose lacquers, printing inks and molding powders.

For detailed technical information, prices and samples of Santicizer 160, write, wire or phone MONSANTO CHEMICAL COMPANY, Plasticizers and Resins Department, 1703 So. Second Street, St. Louis 4, Missouri (phone: MAin 4000)...or get in touch with any District Sales Office. If more convenient, simply return the handy coupon.

PROCESSING ADVANTAGES OF SANTICIZER 160

1. **Compatible with a wide variety of resins.**
2. **Makes possible faster extrusion at temperatures normally employed—existing production rates can be maintained at lower temperatures.**
3. **Imparts low burning rate, oil resistance, heat stability, light stability, abrasion resistance, permanence.**

Santicizer: Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY, 1703 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal.

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Here are the eighth and ninth members of the growing group of FLEXOL plasticizers. These new plasticizers will allow even wider scope to give your products a competitive "edge." They are designed to meet the general requirements of compatibility and non-volatility. In addition, their special properties are such that your investigation is warranted.

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information:

Newsletter,
June, 1948

Long-rumored West Coast production of synthetic phenol will become a reality sometime this summer. Nobell & Co.'s sulfonation-process phenol plant at Azusa, Calif., is nearing completion. Reported annual capacity: 3,000,000 pounds.

You may hear more about a novel method of plating metals. Experiments are being carried out in the laboratories of Commonwealth Engineering Co., Dayton, O., on "gas plating," using metal carbonyls as the metal source.

* * CI * *

Several million pounds per year of 1,2,3-trichloropropane will be available after Shell Chemical Corp.'s new synthetic glycerin plant begins operation this fall. A co-product of glycerin manufacture, the material will be in the price range of ethylene dichloride. It is water-white, 97 per cent pure, contains glyceryl chlorhydrin impurities that act as stabilizers. Uses: paint remover, cleaner for internal-combustion engines, solvent for wire enamels.

Another new Shell plant, scheduled to start operating in September, will produce 2,6-ditertiary butyl-p-cresol (Shell's name: Ionol). It will be marketed primarily as a rubber anti-oxidant.

* * CI * *

Hawaiian sugar producers, desperately short of nitrogen fertilizers, are actively considering construction of their own ammonium sulfate plant in California if arrangements can be made to procure ammonia and sulfuric acid.

Delaware Chemical Co., Wilmington, is expecting to complete a new pentaerythritol plant this summer. Its capacity will be in the neighborhood of 250,000 lbs. per month. Delaware entered the field several months ago with a small production unit.

* * CI * *

A 2 per cent aqueous dispersion of chlordane for ant control is being test-marketed in California. Called "Antrol" by its manufacturer, Boyle-Midway Inc., it will be sold nationally this month.

Also due for national promotion after its California test is the company's new 3-in-One liquid fertilizer. Chief advantage claimed: it doesn't decompose in the container and build up dangerous gas pressure.

Another domestic supplier of streptomycin—bringing the total number to nine—is entering the field shortly. Heyden Chemical Corp. has completed its plant, is ready to launch sales. The U. S., incidentally, no longer enjoys a production monopoly: At least three British and one French firm are rushing facilities to completion.

* * CI * *

In a few months you can expect Carbide and Carbon Chemicals Corp. to reduce the price of sorbic acid from its present $2 per pound and promote uses other than up-grading of drying oils. Carbide will soon have available a new, lower-cost material for oil up-grading.

A recently-issued U. S. patent (No. 2,439,308) assigned to Du Pont may portend a new process for adiponitrile, a nylon intermediate. According to the patent it is produced by a simultaneous dimerization and reduction of acrylonitrile in the presence of magnesium and mercuric chloride by hydrogen evolved by the action of an alcohol on the magnesium.

* * CI * *

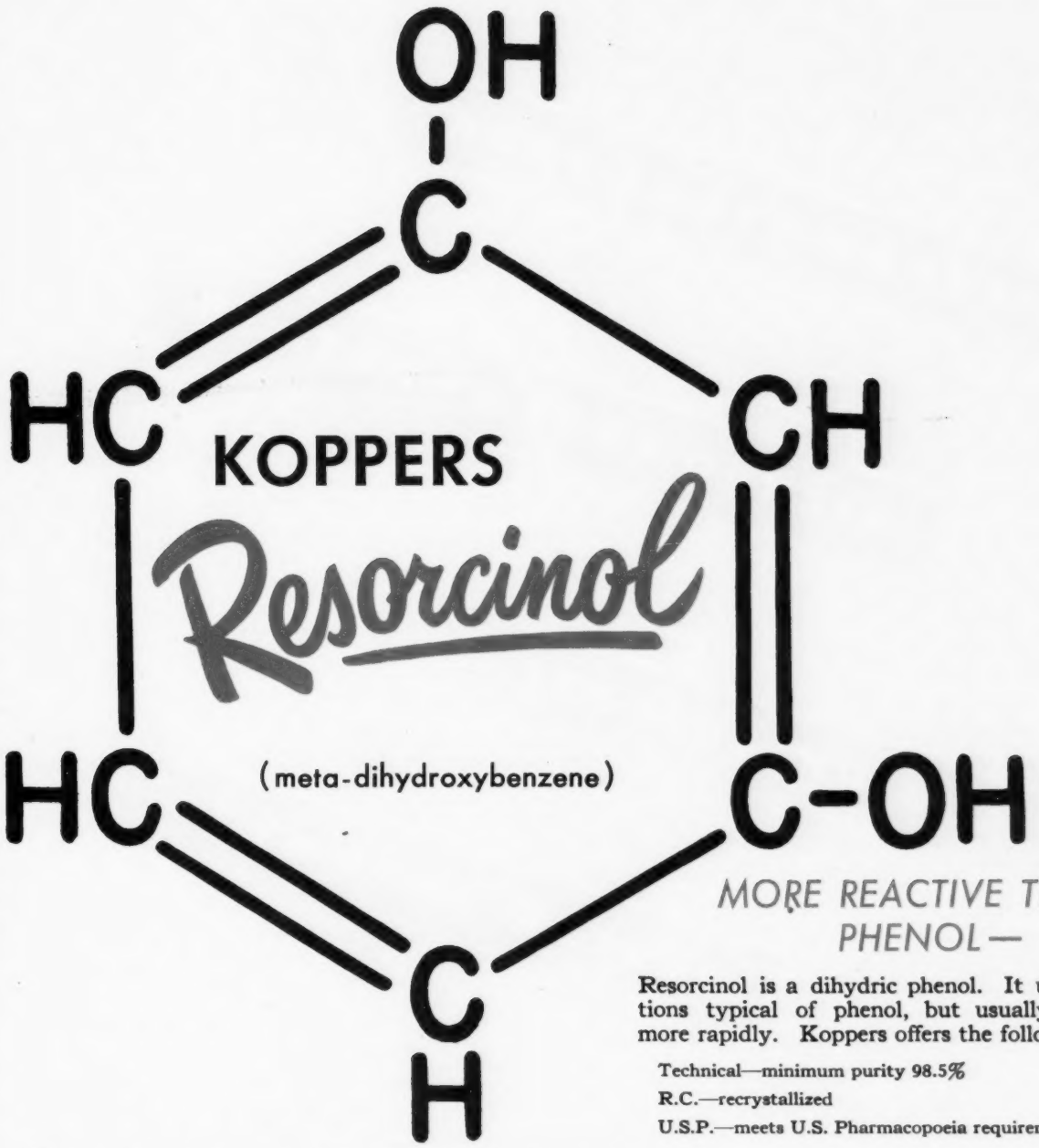
Chemical expansion continues in the western states: Geneva Food & Chemical Co. will make fertilizers and agricultural chemicals at Provo, Utah ... J. R. Simplot will produce 80,000 tons a year of ammonium phosphate at Salt Lake City ... Ground has been broken for Weyerhaeuser Timber Co's new sulfate pulp mill at Springfield, Ore., to utilize sawmill and logging wastes ... Two Spokane mining companies have tentatively leased the Mead magnesium plant, near Spokane, to make ferro-alloys from chromite ores and reduce zinc ores ... The Carborundum Co. has let contracts for preliminary work on its $2-million plant at Vancouver, Wash.

* * CI * *

Here and There:

Despite the toilet goods sales doldrums, Sterling Drug's heavy introductory marketing campaign on its new Dr. Lyons tooth paste, the "magic ingredient" of which is hydrated alumina, is said to be getting results ... A new, important glyoxal use is as an ingredient in cigarette paper adhesives to make them insoluble ... Socony-Vacuum's benzonitrile unit is expected to be in production by early July ... Also scheduled to come into production during July is Du Pont's new nylon yarn plant at Chattanooga. Recruiting and training of workers has already begun ... A new Packard engine design incorporates a vibration damper, mounted on the forward end of the crankshaft, which uses a silicone fluid as the damping medium ... Industrial alcohol manufacturers may soon be asked to report on their output potential in the event of a future war. This is one of the projected surveys which the National Security Resources Board is pondering.

The Editors



MORE REACTIVE THAN PHENOL—

Resorcinol is a dihydric phenol. It undergoes reactions typical of phenol, but usually reacts much more rapidly. Koppers offers the following grades:

Technical—minimum purity 98.5%

R.C.—recrystallized

U.S.P.—meets U.S. Pharmacopoeia requirements

Resorcinol is used by these industries—

Dyestuff— as a raw material for the production of dyestuff intermediates, and for dyes such as resorcin brown and eosin.

Explosive— for the production of styphnic acid, a constituent of priming agents.

Leather—as an intermediate for the production of synthetic tanning agents and leather finishing compounds.

Medicinal—as an antiseptic astringent component of lotions and hair tonics.

Pharmaceutical—for the production of n-hexyl resorcinol and other derivatives.

Rubber—for the production of synthetic resin adhesives, and for compositions giving increased adhesion of rubber to fabric.

Woodworking—for room-temperature curing synthetic resin adhesives which yield water-proof, fungus-proof, weather-resistant bonds; for accelerating the curing rate of phenolic resins and adhesives. Koppers Penacolite ® Adhesives G-1124, G-1131, G-1133, and G-1215 are such resorcinol adhesives.

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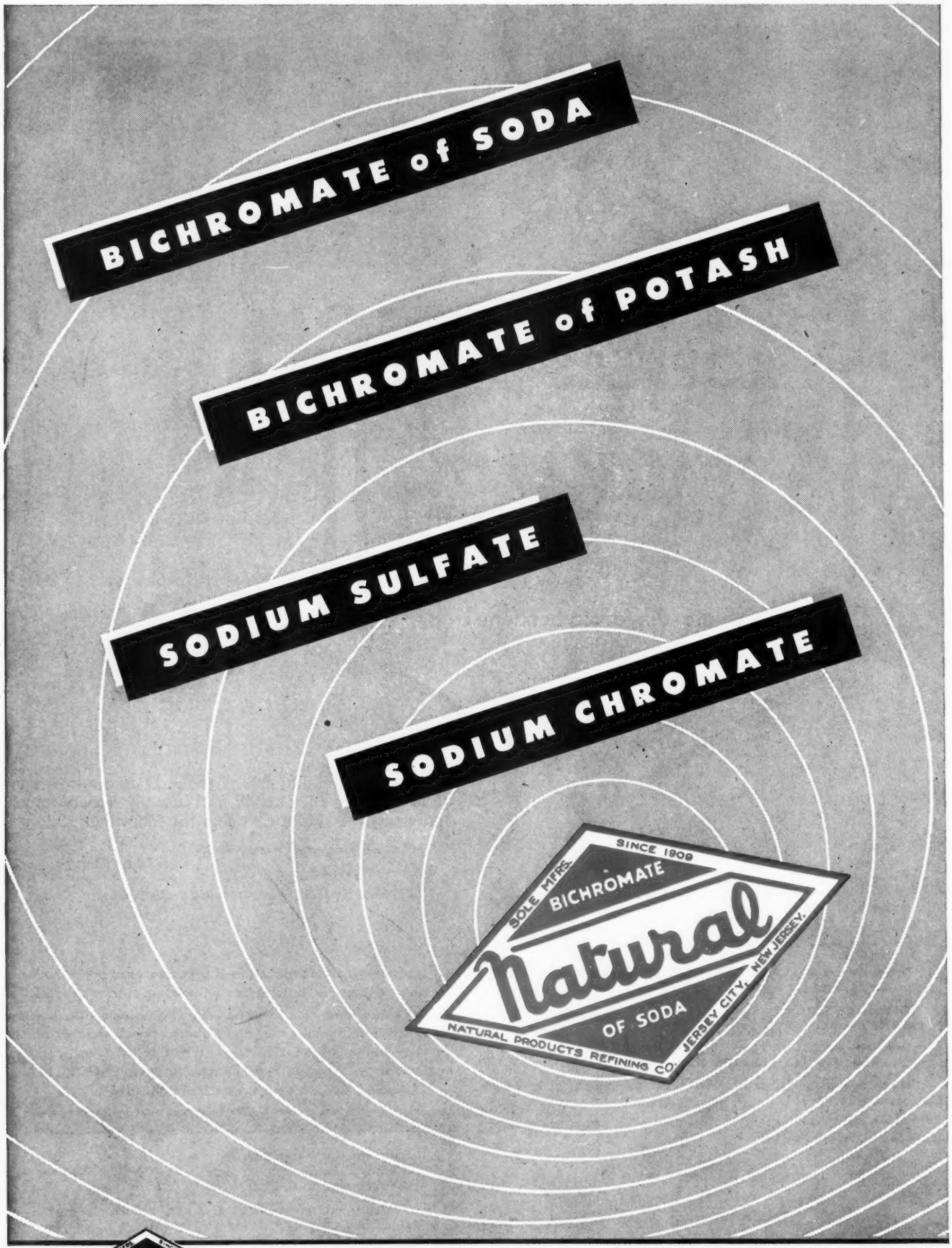

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Editorial CI

VENTURE CAPITAL IN AN ADVENTUROUS INDUSTRY

Guest Editorial by CHARLES S. MUNSON, President
Manufacturing Chemists' Association of the United States

EDITOR'S NOTE: This editorial is based on an address given by Mr. Munson before the 76th annual meeting of the Manufacturing Chemists Association of the U. S. at Skytop, Pa., June 3, 1948. The problem it describes is one that can have far-reaching effects on the chemical industry in this country.

NEXT TO THE POSSIBILITY of war itself, the drying up of risk capital is perhaps the greatest current threat to our American heritage. The problem is peculiarly important to those of us in the chemical industry because our industry traditionally has extremely high rates of expansion, replacement, and obsolescence.

Unfortunately, in 1947 many chemical companies had to resort to bonds, preferred stock, or institutional loans, for new money. From 1939 to 1947, the total funded debt of 11 large chemical companies rose from about $250,000,000 to $700,000,000, while common stock increased from $550,000,000 to less than $600,000,000. In the single year of 1947 the debt structure of these eleven companies more than trebled.

If our industry must plunge this deeply into debt in a single year, what is ahead of us in the leaner years that are certain to come?

Chemical companies dare not allow the funded debt tail to wag the equity capital dog. Our industry is an adventurous one. We have been and must continue to be pioneers. We must continuously undertake new ventures, many of them before commercial possibilities are crystal clear. We are always faced with possibility of sudden obsolescence. These facts make it difficult to live on borrowed money, which saddles the company with heavy fixed charges regardless of the success or failure of the new venture.

But on the few recent occasions when common stock issues have been floated, the value of outstanding shares has declined so substantially as to make new issues of this type prohibitively expensive. And the outlook for any volume of equity financing is dim until conditions change.

Risk capital has been depleted by high inheritance taxes, and high income taxes have prevented it from replenishing itself. That which remains is timid because of the combined effects of high corporate tax rates, double taxation of dividends, and almost confiscatory surtaxes in the upper brackets.

Such capital will remain scarce and timid until it is encouraged by tax revision, over and above the token relief granted this year.

Federal expenditures must be cut, and tax revenues reduced accordingly.

Maximum relief cannot be expected in view of our national commitments here and abroad. But even with the Government's financial requirements at high levels, much can and should be done to ease their impact upon venture capital.

Tax reforms will not come easily. In pressing for tax revision, industry can expect its motives to be misrepresented. This is unfortunate and unpleasant, but not controlling.

What is needed is a sound program of public education—one so comprehensive and so dynamic that every American will become aware of his own stake in this great economic problem.

We must make clear the grim significance of the stagnating economy that is inevitable when risk capital disappears. On the positive side, we must open the public's eyes to the progress that comes from a free flow of this kind of money.

We must tell the story so constantly, so clearly, so appealingly, that we drown out the demagogues and make it politically feasible for our real statesmen to step in and solve this problem.

We have an especially dramatic story to tell. Our industry is new, and young, and vital. It has a tradition of expansion. It can work miracles if it has the funds with which to forge ahead.

Let us tell that story so that all can hear.

If we do, I am confident that the American people, in the wisdom they have always demonstrated, will give us their support.

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and we mean the chemical industry. From its

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SPECIFICATIONS

PURITY: 99% to 100% ester by weight.
SPECIFIC GRAVITY: 1.047 to 1.049 at 20° C./20°C.
ACIDITY: Not more than 0.01%, calculated as phthalic acid.
WATER: No turbidity when one volume is mixed with 19 volumes of 60° Be. gasoline at 20°C.
COLOR: Water-white
ODOR: None

PROPERTIES

MOLECULAR WEIGHT: 278.34
DISTILLATION RANGE: 227°C. to 235°C. at 37 mm. of mercury.
FLASH POINT: 175° C. (347°F.).
MELTING POINT: below -10° C
SPECIFIC HEAT: Approximately 0.43 at ordinary temperatures.
WEIGHT PER U.S GALLON: 8.72 pounds at 68°F.

USES

Most widely used plasticizer for cellulose ester and cellulose ether lacquers.

THE SOLUTION to many lubricating problems, where a greaseless lubricant is desired.

Anti-foam or anti-frothing agent.

USED EXTENSIVELY in the manufacture of lacquers, plastics, adhesive tapes, printing inks, food closures, smokeless powders, brake lining varnishes, and a host of other industrial products.

MERITS THE CONSIDERATION OF EVERY RESEARCH AND INDUSTRIAL CHEMIST!

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CSC

What's new

DYE OUTPUT CATCHING UP

Explosions, strikes, the "New Look" and divers calamities have beset dyestuffs producers, but 1948 output will set a record.

FRANK MILLER was mad. His tanners in Gloversville, N. Y., were scraping the bottom of the dye barrel, and if new supplies of black dye were not forthcoming soon, a layoff was imminent.

Miller's plight—and the similar plight of other hundreds like him—was of grave concern to C. C. Concannon, Chief of the Office of International Trade's Chemical and Health Products Branch. He read Miller's letter to a recent meeting of dyestuffs manufacturers, representatives of their customers' representatives and Government officials.

These men aired some weighty questions: Should the Government impose rigid export controls on dyestuffs? Should "gray-marketers" be ferreted out and hanged? Or should time—which heals all things—be given for the turbulent waters of supply and demand to seek their level?

The meeting, and a few of the problems discussed there, are past history. But there is still a dyestuffs shortage, and an appraisal of today's situation may outline the shape of the future.

Help in Time of Trouble

Customers, who can't get all the dyes they want when they want them, are hopping mad about exports. Why should Europeans get beta naphthol, they ask, while American feet go unshod for lack of black dyes?

For one thing, export licenses for individual shipments would require more red tape than the Government can afford. For another, dyes are very complex and not easily identifiable. Export controls would require not only reams of paper work, but hours of laboratory testing to make sure that a foxy exporter isn't putting something over on Uncle Sam.

But the most compelling reason is the inherent desirability—not now, perhaps, but later—of foreign markets. Before the recent war Germany supplied half the world's export market; Japan was the second largest supplier. Today the U. S. has won, largely by default, Germany's and Japan's former customers, and the only way to keep them is to keep them happy. Argentina, for example, is a good customer for U. S. dyes. Before the war Germany supplied most of that country's dyes; and European sources will regain the business, Argentine importers maintain, unless the U. S. can send the necessary quantities. Britain and Switzerland, meanwhile, aren't letting any grass grow: They're building dye works and sending out salesmen instead.

Domestic manufacturers certainly don't need exports now. But in normal times foreign business can cushion the bounces of home demand, adding a penny or two to the till when they're most useful.

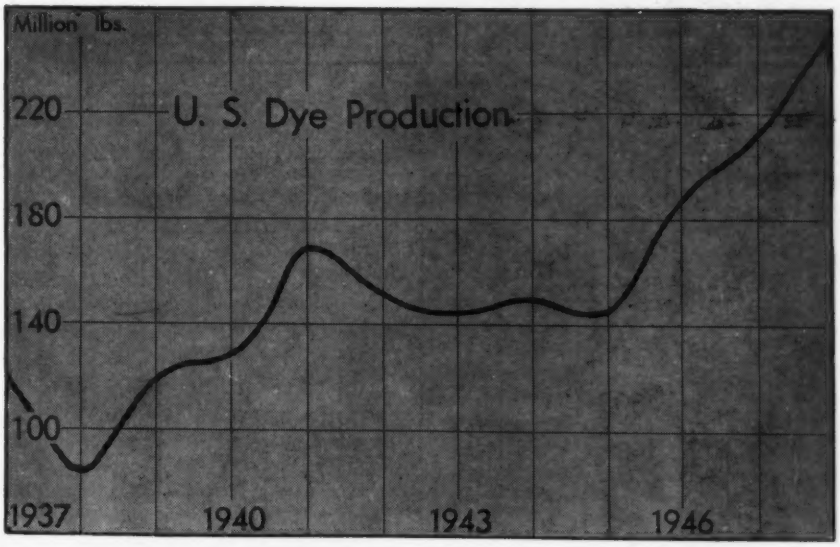
Gray Market Bleaching

It's no secret that a small part of the domestic dye output has been diverted—at fabulous profit—to the export gray market. Sulfur black, nominally 27c per lb., has gone as high as $1.80. A few mills hollered for dyes at the front door and sold to resellers from the back. Calco Chemical Division of American Cyanamid Co. wrote a strong letter to its customers: ". . . if we can establish any such practice against anyone buying dyes from us, we shall take immediate action and promptly discontinue selling such parties." But how can one "establish any such practice"? One can't send spies into a customer's plant or subpoena his books. And even if the practice were established, it's doubtful whether a contract for sale can legally limit the use to which the merchandise is put.

Fortunately, the gray market is getting whiter all the time. Resellers' prices are approaching normal as supplies are becoming more abundant.

Highest Hill

Yes, supplies are gradually becoming easier. Last year was marked by a lamentable series of uppercuts and jabs to the dye industry: An explosion in January knocked out Du Pont's beta oxynaphthoic acid production for the whole year; the steel and coal strikes of 1946 cut down the amount of coal-tar crudes, and the Monsanto strike held up important intermediates. Then



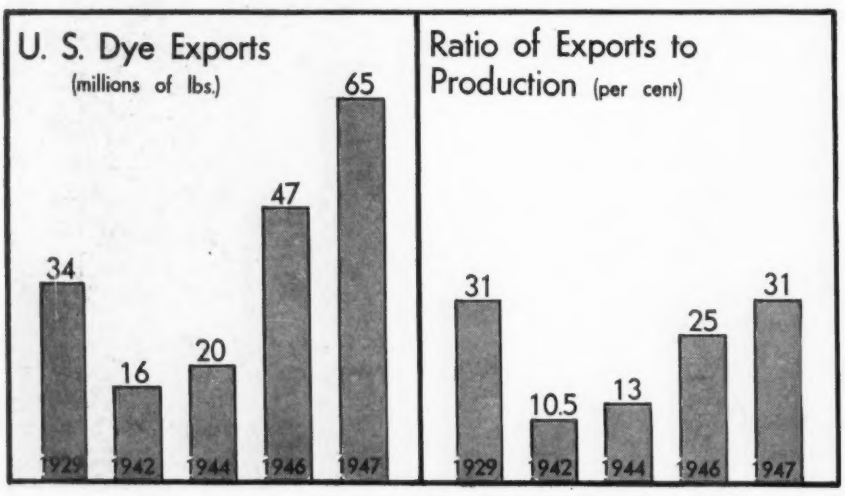
DYE OUTPUT: Climbing the highest hill yet.

along came the ill-timed "new look," creating additional demand for fabrics at a time when dye manufacturers were unprepared to boost output proportionally. Black suede, too—a notorious soaker-up of dyes—was in fashion. Add to this the ever-present crisis described by E. K. Halbach, General Dyestuff Corp.: "You have plenty of black and you get a navy season. You have plenty of navy and you get a green season." Thus is the inscrutable face of fashion.

In spite of these hurdles, dye output rose an estimated 10 to 15 per cent in 1947 over the preceding year. Currently, azo and vat dyes are still scarce. Materials have been scarce and capacity expansion is necessarily slower because more equipment is required. The less important sulfur and indigo dyes are in good supply.

U. S. dye production wavered during the '30s (In 1939 it was only slightly higher than in 1929), shot up rapidly until we entered the war, wavered again until after the war, and has since started to climb the highest hill on the graph. This year, says A. F. Clark of Calco, should see a 15 to 25 per cent rise in output over 1947. The present market is attractive, but there's a 12 to 15 months' lag between the decision to expand and the finished plant. If expansion ideas are still being conceived—and there's no reason to doubt it—more new facilities will be born in 1949.

Thus it appears that domestic consumers may get their dyes without trouble, the gray market may wither and die, foreign customers may be able to satisfy their needs here—all before many months have passed. What will happen after that is no easier to predict than the colors of next Spring's skirts.



EXPORT DATA: More going away, but still more remaining.

RED HOTS HERE

Now Tracerlab, Inc., will manufacture and stock "hot" radioactive compounds.

A LOT OF beta and gamma rays are buzzing around 55 Oliver St. in Boston this month. Tracerlab, Inc., is busily making and bottling the first few of its series of compounds containing radioactive carbon-14 for sale to universities, industrial research groups, hospitals, and others. Among the first compounds to be made available are barium carbide, acetylene, sodium cyanide, methyl alcohol, and methyl iodide. Others coming along in the next four months are acetic acid, acetyl chloride, and ethyl acetate (both carboxyl-labeled and methyl-labeled); ethyl alcohol and ethyl iodide (both methylene-labeled and methyl-labeled); and benzene. Others will be added from time to time as demand warrants.

Radar and the Bomb

Tracerlab had been waiting and hoping for the day when it could start on this project. The organization was founded early in 1946 to exploit the atom—several months before momentous August 2, when the Atomic Energy Commission first released radioisotopes for research—by a group of young men, most of whom were from Massachusetts Institute of Technology's radiation laboratory. Among them were Ray Ghelardi who, with three other radiation lab alumni who have since left the company, founded Tracerlab's short-lived predecessor, Industrial Electronics Laboratory; Bill Barbour, an M. I. T. engineer, who put up most of the capital; and Wendell Peacock, of M. I. T.'s physics department, who sparked the group with the idea that gave the company its footing.

That idea was the application of certain radar techniques to radioisotope measurement. The incarnation of the idea is the Autoscaler, a machine that can be set beforehand to count a predetermined number of disintegrations. The time required for 4,096 disintegrations (the number customarily used) determines the activity of the sample within 1 per cent accuracy. The company makes and sells these machines as well as other types of equipment for radiochemical laboratories.

Although Tracerlab got off to a head start, it is by no means the only runner after the radiation bandwagon. At least two other firms, both in Chicago—Radiation Counter Laboratories and Instrument Development Laboratories—are digging their cleats into the turf. The former, according to a company official, started off at the same time as Tracerlab with a good deal less capital and is now equal in size.

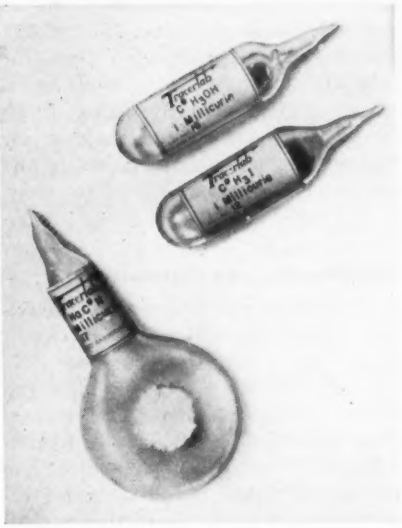
Available Radiochemicals

BaC^*_2	$C^*_6H_6$
$CH{\equiv}C^*H$	$CH_3C^*H_2OH$
NaC^*N	$CH_3C^*H_2I$
C^*H_3OH	C^*H_3COOH
C^*H_3I	C^*H_3COCl
CH_3C^*OOH	$C^*H_3COOC_2H_5$
CH_3C^*OCl	$C^*H_3CH_2OH$
$CH_3C^*OOC_2H_5$	$C^*H_3CH_2I$

Playing with Fire

But it was after August, 1946, that Tracerlab cracked out of its not-too-extraordinary shell and became a unique bird. Others had invented and manufactured new laboratory equipment; but nobody had ever made a business of processing radioisotopes. Customers of the Atomic Energy Commission could now have their isotopes—prepared at Oak Ridge in a limited number of chemical forms—sent to Tracerlab for synthesis into desired radioactive compounds of assayed purity and strength.

A customer for radiosodium, for example, can buy it from the AEC only in the form of sodium-24 carbonate; but he wants radiosodium chloride in a concentration of one millicurie per liter of water solution. He has the



RADIOCHEMICALS: Isotopes in the pantry.

carbonate sent to Tracerlab, where it is processed in one of the "hot labs" to sodium-24 chloride, diluted, and assayed for radioactive strength. Tracerlab has the facilities for playing with the atomic fire of strongly radioactive compounds, processing them into convenient forms for safe handling.

Off the Shelf

Until a few weeks ago, each order was a custom job. The AEC processed each application for isotopes individually, didn't allow Tracerlab or anyone else to keep an inventory of radiochemicals. That made for high cost, since individual preparations of small amounts required as much labor as one large batch.

Tracerlab was the first commercial organization to take up AEC's offer allowing companies to manufacture and stock radiochemicals.

These chemicals must still be applied for through the AEC and used in accordance with the Commission's stipulations, but they are sent directly from Tracerlab upon receipt of the purchase order and the AEC-approved application.

Commercial Use Coming

Use of radiochemicals is still governed by the same regulations laid down by the AEC when they were first offered; i.e., they must be used for research and the results must be published. As isotopes become more readily available, however, they will undoubtedly be released for routine applications in process control, analysis, identification, and other uses where isotopes can do very simply those things which have hitherto been very difficult or impossible. When that day comes isotopes will radiate dollar signs, and Tracerlab—having been in on the ground floor—will be prepared to capture those radiations.

SERIES OPENER

Alkylated aroyl sulfopropionic esters take bow as new type synthetic surface active agents.

SEVERAL years ago in the course of research on surface active chemicals, two of E. F. Houghton & Co.'s chemists, J. T. Eaton and G. W. Hedrick, were discussing the possibilities of diamyl phenoxy acetic acid. Hedrick suggested that perhaps a substituted benzoyl acrylic acid might be just as good or better. This suggestion was a very fortunate one, not because it turned out to be entirely correct, but rather because it directed the thoughts of these chemists toward this type of molecule and its possibilities.

Shortly thereafter the steps from diamyl benzoyl acrylic acid to its methyl ester and the sulfonation of this molecule suggested themselves. When these proved not too difficult to carry out, a new type of synthetic surface active agent, chemically described as the alkylated aroyl sulfopropionic esters, was born.

Permutations and Combinations

The potential number of chemicals in this series is very large, as is the number which might be synthesized from materials readily made or purchased. Those containing from 12 carbons up to about 30 carbons exhibit definite surface active properties, and certain members in the group have proved to be outstanding wetting agents and detergents.

In a paper presented before the Philadelphia section of the American Chemical Society on January 22, Eaton reported that more than 100 different members of this series had been made. His information showed that structures desirable for wetting are different from those for detergency.

One of the chief obstacles in the successful conclusion of this development has been the working out of satisfactory procedures for the synthesis of the substituted benzoyl acrylic acid. Considerable information exists both in the patent literature and in academic literature on the condensation of alkylated aromatic hydrocarbons with maleic anhydride. By the use of selected chlorinated solvents and the careful standardization of condensation, this barrier was hurdled.

The second synthesis involves the esterification of an aroyl substituted acrylic acid with a suitable alcohol. The resulting ester is then reacted with sodium bisulfite, either under atmospheric conditions or slight pressure. Here too, the kinks were solved.

When the Debut?

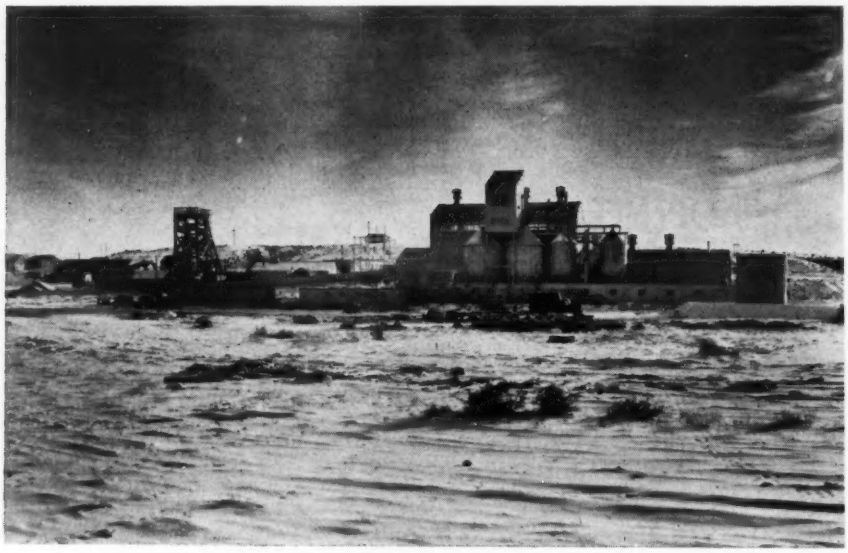
Since these compounds seem to have enjoyed a storybook career, it is natural to question the lag between discovery and exploitation. A good part of it is the slow job of working out procedures that never run so well in practice as on paper. The rest is a familiar story today—shortages of equipment and raw materials for quantity production. Maleic anhydride, in particular, has been, and still is, short.

Despite these delays, Houghton hopes to start drawing dividends on its research investment by introducing the first product of the new series as a member of the Surfax group in June or July (CI Newsletter, April, 1948).

This is an excellent wetting agent (molecular weight of the active ingredients will lie in the 400-450 range and the hydrophilic group will be near the middle of the molecule) which has shown considerable promise for textile processing as a wetting or sanforizing assistant and leveling agent in dye baths. It may also be used for rewetting on paper and for increasing absorbancy on paper.

Houghton has great expectations for the new Surfax and for others in the series that will follow as detergents and emulsifiers. Eaton and company should find steady employment in investigating the many possibilities of the family they have fostered.

J. T. EATON: A family is born.



TRONA PLANT: Up from 1500 feet below.

WESTVACO TAKES A HELPMATE

Westvaco Chemical Corp. merges with Food Machinery Corp., coincidentally expands operations to achieve integration of its raw material sources.

SOMETHING was in the wind, and Wall Street was buzzing with rumors last month. Finally the news broke —that Westvaco Chemical Corp. will become (subject to expected approval this month by stockholders of both companies) the Westvaco Chemical Division of Food Machinery and Chemical Corp., as the new entity will be called. Westvaco's present management will continue to run the Division.

Only a few weeks earlier, Westvaco announced that it had outgrown its old name, Westvaco Chlorine Products Corp.

The marriage is not a shotgun affair, for the apparently dissimilar couple have several interests in common. Westvaco stockholders, who will get 1¼ shares of Food Machinery common for each share they hold, will also get equipment design and production experience, and an established agricultural market for chemicals (Food Machinery recently acquired insecticide-making Niagara Spray Co., is said to have a joint interest with Michigan Chemical Co. in another small chemical concern). Food Machinery, on the other hand, will get the chemical wherewithal to increase its penetration into the agricultural and food-processing fields. Furthermore, the combined capital assets will give greater freedom and flexibility in exploiting new developments.

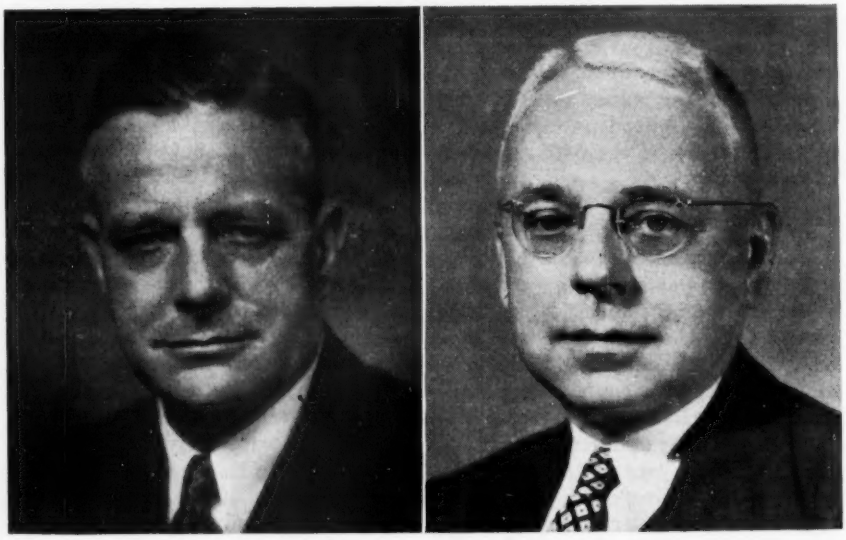
Significantly, the change in corporate set-up comes at a time when Westvaco is integrating its operations—from raw materials to finished products—into a more closely-knit pattern. Completion of projects now in the works will free the company from dependence on outside suppliers for all of its major raw materials.

Most of its sales are derived from five major raw materials: trona, ($Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$), salt, seawater or magnesite, and barite and phosphate ores. The new electric-furnace elemental phosphorus plant at Pocatello, Idaho (CI, Jan. 1948, p. 49) and the recently completed plant for production of soda ash by trona calcination at Westvaco, Wyoming, mark the final step toward raw material independence; salt brine, magnesite and barite have previously been produced by the company.

From Phosphates to Phosphates

Any study of Westvaco's growth must start with the predecessor company, the Warner Chemical Co., formed in 1886 to commercialize the phosphate deposits of Grand Conneatable Island off the coast of French Guiana. Attempts to combine the phosphate values of the Grand Conneatable rock with ammonia or potash for production of fertilizers were complete failures. Dr. Lucien Warner, the founder, next directed his attention to the production of other phosphate products, turned out, at Carteret, N. J., the first domestic phosphoric acid and also trisodium phosphate.

The Grand Conneatable deposits were no longer exploited when Florida phosphates became available. Manufacture of phosphoric acid from phosphate rock at Carteret by the wet process (phosphate rock plus sulfuric acid) ceased in 1937, when phosphoric acid became available from other sources. Eventually elemental phosphorus was purchased, burned, and absorbed to make the phosphoric acid required for reaction with soda ash to produce the various sodium phosphates. Now, with the Pocatello plant under way, further expansion of phosphate operations will be at Green River, Wyoming, where the soda ash is located. Phosphates contributed



THOM AND SEATON: A hand on the helm, a user of bitterns.

about 15% of Westvaco's total sales in the first six months of 1947.

Chlorine Steps In

The company's largest sales volume —about 31% in 1947—is in caustic and chlorine. Company officials state that their Charleston, W. Va. unit is "one of the largest electrolytic chlorine-caustic soda plants in the world."

Chlorine did not become a part of Westvaco's product structure until 1906 when Warner first produced it at Carteret. At that time chlorine had to be used where it was made, for it wasn't until 1909 that liquid chlorine was first shipped under pressure. This chlorine eventually appeared in the form of, first, phosphorus trichloride and phosphorus oxychloride, and somewhat later as carbon tetrachloride, acetyl chloride, acetic anhydride, and sulfur chloride.

World War I caused an enormous growth. E. C. Klipstein Co., also of Carteret, was merged with Warner in 1915 to form the Warner-Klipstein Co. The new company built the first section of the plant which is today the Charleston works. Klipstein's interest in the new company was acquired by Westvaco in the early '20's.

Westvaco and Aliphatic Chemicals

Two seemingly unconnected events occurred in 1925. Commercial productions of aliphatic chemicals from petroleum hydrocarbons got into full swing under the aegis of the newly-formed Carbide and Carbon Chemicals Corp. Westvaco Chlorine Products Co. was formed the same year to consolidate Dr. Warner's chemical interests following his death. W. B. Thom, who had served as secretary of the Warner Chemical Co., was placed in charge of the new venture as president and he has been at the helm ever since.

These two occurrences coalesced in 1927 when a contract for sale of chlorine and caustic was signed with Carbide. The importance of this contract, now running until 1952, can be partially assayed from the fact that sales made under it amounted to approximately 14% of total sales in 1946, or roughly $2,500,000. This was nearly half of the company's sales of caustic and chlorine. This combination was the cornerstone of the huge petrochemical industry, now the source of over 50% of all aliphatic chemicals and using over 75% of all the chlorine produced in the country (CI, May, 1947, p. 582).

But Westvaco itself is a sizable producer of halogenated aliphatic chemicals: chloral, acetylene tetrachloride, trichlorethylene, carbon tetrachloride, carbon disulfide, methyl bromide, and ethylene dibromide. These compounds contributed 18% of total sales in the first six months of 1947.

United Chemicals, Inc.

In the late '20s, Westvaco, through the then-new holding company, United Chemicals, Inc., began acquiring new operations. In rapid succession all but a minor interest in Barium Products, Ltd., Modesto, Cal.; full interest in the Monarch Chemical Co. at Carteret, N.J.; and, in 1930, a majority interest (in 1937, full interest) in the California Chemical Corp. at Newark, Cal. were acquired.

Acquisition of Monarch put Westvaco squarely in the baking powder business, although the latter or its predecessor had been supplying Monarch's phosphates since its founding at Carteret in 1901.

Barium Products makes various barium compounds, hydrogen peroxide (via barium peroxide), sodium sulfide, and blanc fixe, primarily at Modesto, Cal. Hydrogen peroxide is also produced at Carteret. The principal raw material is barite, mined by the company at Battle Mountain, Nev. and Almanor, Cal. Barium Products contributed about 9% of the total net sales in 1946.

California Chemical Corp.

California Chemical Corp. was founded to produce various grades of magnesia, first from magnesite, later from seawater. The liquid bitterns produced by the evaporation of seawater for the production of salt by the Leslie Salt Co. were an ideal source. This changeover to bittern—due primarily to the efforts of M. Y. Seaton, now executive vice-president of Westvaco—was completed in 1938. All grades of magnesia, as well as ethylene dibromide, are produced at Newark, Cal. Magnesium chloride is made in another small plant at Chula Vista, Cal.

Burned oyster-shell lime was used for the precipitation of the magnesium hydroxide in the bittern purification process; but a dolomite-yielding property near Hollister, Cal., was recently purchased, the product of which has replaced oyster shell. Magnesium chemicals made up approximately 10% of Westvaco's total net sales in 1946.

California Chemical's work with seawater bitterns has also resulted in the production of bromine from the same bitterns used for magnesia manufacture. This is used to make the fumigants methyl bromide and ethylene dibromide. These materials are also produced from brine at Charleston.

WESTVACO PLANTS: The westward trek is on.

Agricultural Chemicals

Recently the company has greatly expanded its agricultural chemical operations. Its entering wedge in this field was methyl bromide and ethylene dibromide for soil and grain fumigants. Manufacture of DDT was started at Carteret in 1945, using chloral produced at Charleston. Benzene hexachloride and hexaethyl pyrophosphate are more recent additions. By 1947 insecticide sales contributed 9% of the consolidated net sales.

Diversity of products and raw material control are twin pillars on which Westvaco rests its hopes for future prosperity. It has worked for others —why not again?

MOLECULAR RADAR

Techniques first associated with radar may become powerful analytical tools in chemical laboratories.

RADAR can detect not only enemy planes and ships, but also the characteristic rotations and vibrations of molecules.

That's the word from Professor George Glockler, head of the University of Iowa's chemistry department. He is working with Professor Arthur Roberts, of the physics department, in a study of microwave absorption spectra.

Microwave spectra are analogous to those in the more familiar visible and infrared regions, in which spectrographic analysis has become common. Most atoms and molecules also show characteristic absorption in the microwave region, where the waves are much longer and the frequencies much lower than those of visible light. The principles of these absorption patterns are exactly the same in both the visible and microwave regions, and the microwave method is likely to prove particularly useful for many elements and compounds which exist in the gaseous form.

A Little Goes a Long Way

An outstanding advantage of microwave analysis is that only a very small sample—as little as 0.0000001 mols, and theoretically even less—is required for accurate analysis. The procedure is fast and the equipment is in most cases commercially available. Also, the sample is not destroyed or even affected by the analysis.

Electronic equipment is now on the market to study absorption patterns for frequencies up to 30,000 megacycles (1 centimeter wave length). These are the same frequencies used for World War II radar, and the absorption phenomena now being studied are exactly those which limited radar range during the war. The use of microwave absorption analysis will be broadened, says Roberts, when equipment for a wide range of the higher frequencies is available. The basic engineering problems for such equipment have been solved, and increasing demand may soon lead to development and production.

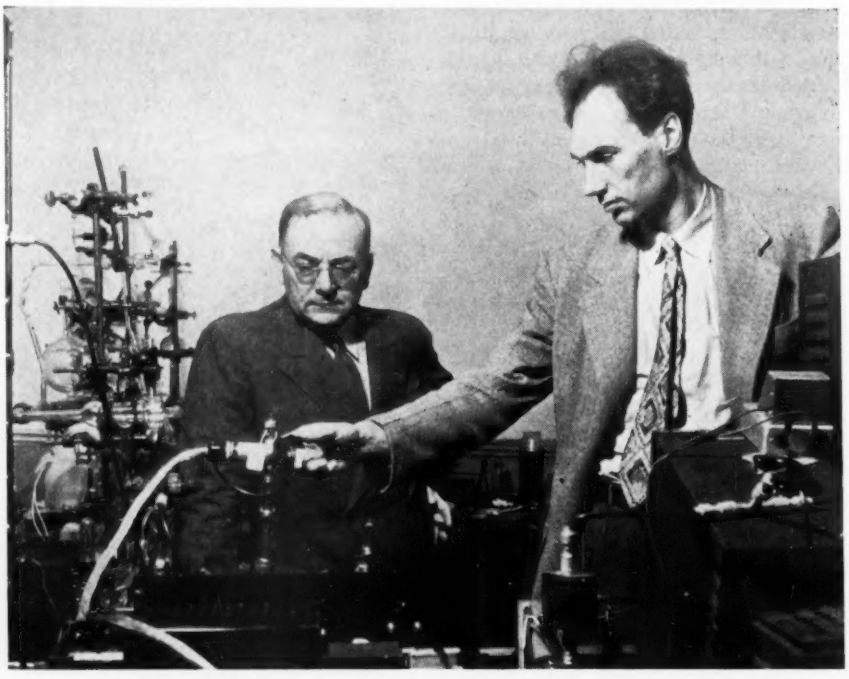
Only milliwatts—or even microwatts—of radio-frequency power are necessary for analysis, and a klystron (electronic tube) source is doing a good job at the University of Iowa. Microwaves from the klystron are fed into a wave guide containing the gas sample at low pressure, and the output from the wave guide is measured with a standard detector and amplifier. By varying the klystron frequency, the operator can plot absorption as a function of frequency. The gas sample is contained in the wave guide at a pressure of 0.01 millimeters of mercury or less, and a sample of 0.1 cc is more than adequate. Dilution by foreign atoms is inconvenient, says Roberts, but extreme purity is not necessary.

Spots Isotopes

The microwave method has been used at Iowa in the analysis of several gases, especially carbonyl sulfide. The method not only identifies the compound involved, but indicates the concentration of various isotopes within the compound—each of which shows up as a separate absorption line. Spectra of COS have shown lines due to the presence of carbon-13 and sulfur-33 in concentrations of less than 1 per cent. COS containing radioactive carbon-14 has been prepared and the radioactive isotope of sulphur, sulfur-35, will soon be used.

But more important than isotope identification is the use of microwaves to study atomic and molecular structures. The hyperfine structure observed in characteristic atomic line spectra has been interpreted as a result of nuclear spin, and the spinning nucleus—like the spinning earth—has a magnetic field. Now the spinning motion is actually measurable as a function of microwave absorption frequencies. Accurate absorption data also allow scientists to calculate molecular moments in inertia, which in turn lead to accurate figures for interatomic distances and the strength of interatomic bonds in molecules.

In this way, Glockler intends to use data obtained from microwave absorption studies to find out more about the details of molecular structure and the vibrations of atoms within them (force constants). When these are known, it will be possible for him to calculate thermodynamic properties, confirm values of specific heats, and perhaps develop new uses for familiar chemical compounds.



GLOCKLER AND ROBERTS: Hours of labor for moments of inertia.

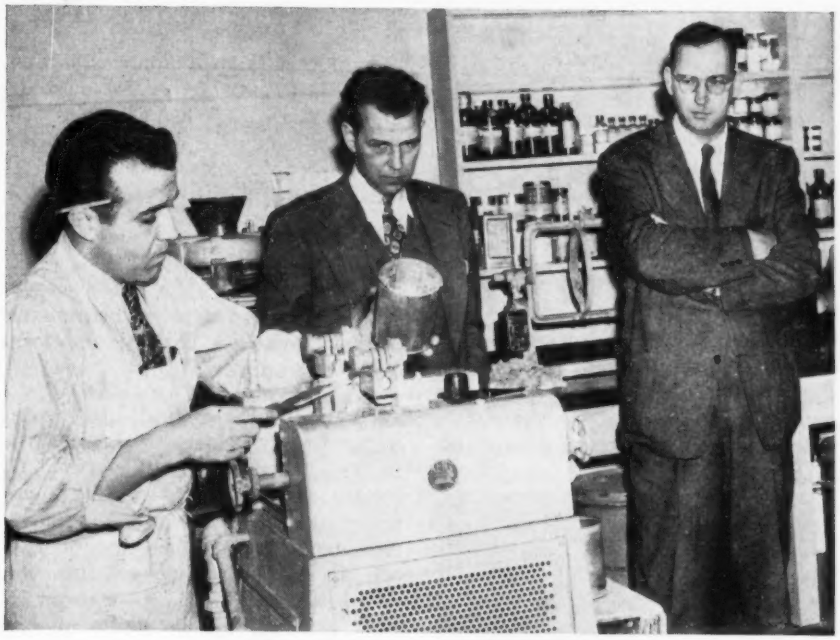
TAILORED OILS

New line of oils highlights trend to custom-tailored paints.

TWO NEW million-dollar plants to produce synthetic vehicles for the paint, varnish and protective coating trade are indicative of the confidence (and money) Archer-Daniels-Midland Co. has placed in its new series known as Admerols. With the unveiling of the first four numbers, some in the industry feel they are looking at forerunners of something long anticipated: a wide range of finishes "tailor-made" for various jobs.

More Than Oils

A-D-M believes its product offers a balance of properties that none of the "synthetic drying oils" introduced in this country and abroad can equal. Unusually fast set and through dry,



SYNTHETIC VEHICLE: Just grind in pigment.

low acidity, excellent stability and uniformity, high gloss and color retention are claimed for the new oils.

More Than Oils

These materials actually are more than oils. Paints for many purposes can be produced by merely grinding in pigments and reducing the grind in the usual manner. With one Admerol or a blend of two as the sole paint binder, a formulator can forget about other oils, varnishes, cold cuts and resinous materials, and still turn out a good product.

If certain of the monomers mentioned by A-D-M have been reacted with fatty acids to produce these vehicles, it appears that the company has gone beyond previous efforts to replace conventional oils. Announcements by A-D-M have been no more specific than to note that butadiene, styrene, pentaerythritol, cyclopentadiene, acrylic acid and sorbitol have been used with linseed and soybean oils as glycerides or fatty acids in the development work on these vehicles, and that several are in the commercial products. Others will be used in new Admerols yet to be announced. The company is definite in stating that this is the first time the particular combination of monomeric substances and natural drying oils used has given a finished-type vehicle with the properties claimed.

Adoption of these new vehicles is said to simplify the manufacturers' problems by reducing inventories, eliminating complex manufacturing schedules, and lowering processing costs. As is obvious, the products already have all the properties of finished vehicles, and further cooking is not necessary. Since it is claimed that the four now being offered will, individually or blended, answer most of the requirements of the manufacturer, fewer vehicles and simpler formulations are required.

Savings in manufacturing costs of varnishes, alkyds, and paints are said to be achieved concomitantly with reduction of formulation problems. In making alkyds, costs lower by 34.2 cents per gallon for non-phthalic short alkyds are claimed for the Admerol replacements. In preparing various white enamels, savings of 10 to 46 cents are indicated as typical by the company when Admerols replace alkyd formulations. However, some of this advantage may disappear if oil prices continue downward.

A matter of importance to the manufacturer, but still of more moment to the worker who has to use the paint, is its brushability. The new materials have shown themselves equal or superior to older-type vehicles of comparable class and formulation in this respect. They brush out easily and level well without sagging.

Other Developments

Although the Admerols appear to mark a high point in that these finishes require little further formulation by the manufacturer, progress along this line has been made in other quarters: In England, Lewis Berger and Sons has been marketing "styrenated oils" for some time; among companies offering these either as oils or copolymer resins in this country are Spencer Kellogg & Sons, Inc. (Keltrol), A. J. Wittenberg Corp. (VBR-101 and VBR-200), American Alkyd Industries, Inc. (Amaflex), and, most recently, Reichhold Chemicals, Inc. (Styresols). The Dow Chemical Co. has been glad to offer technical advice along with the sale of its styrene, and the paint men have drawn on their own staffs to learn how to incorporate the monomer into their compounds. The factors of cost and scarcity of linseed oil and phthalic anhydride have given this development impetus.

Other improved drying oils or finishes have had maleic anhydride or pentaerythritol incorporated into them to give an upgraded effect. The Bakelite Corp. has not offered an improved drying oil as such, but several of its finishes contain them. Moreover, Carbide & Carbon Chemicals Corp. will market an experimental oil up-grader for drying oils or alkyds. This will be a low-molecular-weight polymeric unsaturated hydroxy acid that splits out water to develop a conjugated unsaturation at the temperature of the alkyd or varnish cooks. When a pilot plant run (scheduled for the near future) makes enough available for testing, Carbide feels that its lower cost and lower volatility will give it the nod over sorbic acid.

No Doubts

A-D-M efforts along this line have included five years of research and development work, much of it by a group of men under Louis I. Hansen of its research laboratories. The first commercial unit for production of the Admerols went into operation last December in Minneapolis. Another large plant will follow shortly at Edgewater, New Jersey, while a third is being converted to supply expected demand.

BORER BATTLE

U. S. DEPARTMENT of Agriculture scientists are continuing their search for insecticides to fight the European corn borer. Some previously unpublished results of field tests made during the last three summers were recently made known. Three promising compounds are described: 1-phenylsemioxamazide, $C_6H_5NHNHCOCONH_2$; bis- (disalicylal) ethylenediamine, cobalt salt, $(CH_2N{:}CHC_6H_4O)_2Co$; and 5-methyl-1-phenylsemioxamazide, $C_6H_5NHNHCOCONHCH_3$.

None, unfortunately, is as good as DDT, but some promising lines of investigation are indicated.

X-RAY DOG TAGS

Index of X-ray diffraction measurements provides identification of 3,000 compounds.

FEAR OF A latent propensity toward crime keeps the most mild-mannered citizen from having his fingerprints registered unless he has no choice. If such suspicion of positive identification carried over to inanimate objects, the compilation of X-ray diffraction measurements at the Bureau of Standards would not be approaching 3,000 compounds.

This index is a project that began two and a half years ago at the Bureau as a joint effort with the American Society for Testing Materials and the American Society for X-Ray and Electron Diffraction. Most of that time was spent in organizing equipment and technique, and now Howard E. Swanson, the director of the project, and H. F. McMurdie, the other half of the staff, are anxious to catalogue more powder samples.

Just Like a Fingerprint

A characteristic property of crystalline materials is the regular arrangement of component atoms. Since the wavelength of X-rays is of the same order of magnitude as the interatomic spacing in crystals, these rays, when directed through substances, are diffracted by the crystals which act as a three-dimensional diffraction grating. For any particular crystalline species, the angles and intensities of the diffracted beam provide a unique pattern which makes identification as positive as a fingerprint. It is interesting to note that this is a practical application of what was pure theoretical reasoning when Laue in 1912 suggested crystals for measurement of X-rays.

Cards are indexed according to the angstrom value of the strongest line. That is, the spacing interval of the reflection with the greatest X-ray intensity determines at what point in the index it should be placed. The cards are also cross-indexed according to their chemical names.

Such improvements as the use of the Geiger counter to make closer measurement of atomic spacing, and its modification to measure a greater range of diffraction angles, have increased the accuracy of data. At the Bureau of Standards, it is a practice to analyze specimens prepared under almost opposite conditions. By these methods, data that are uninfluenced by inherent differences in equipment are obtained.

In the course of these measurements, a small percentage of the X-ray data has been discovered to be conflicting or misleading. Such discrepancies are to be expected in gathering published material from many sources over many years. Where specific data have been questioned, the Bureau is attempting to provide the correct information.

One Big Contributor

In addition to the societies mentioned above, and the Institute of Physics which gathers English X-ray measurements for the file, many laboratories have contributed data. Most

H. E. SWANSON: He knows the angles.

contributions have been on a small scale, but The Dow Chemical Co. has been the outstanding exception. It has spent considerable time and money in promoting such a project, and has made the first substantial donation—data on about 1,000 substances. Industrial laboratories with special interest in synthesizing certain chemicals have been the best sources of samples.

X-ray diffraction has certain advantages over ordinary methods of chemical analysis of crystalline materials. Since the results are obtained directly in terms of compounds instead of elements or oxides, the X-ray patterns indicate the particular crystal form or hydrate of a compound, and, in the case of mixtures, give the form of both compounds.

Swanson points out that the usefulness of this method for crystalline substances is limited only by the completeness of the file. There are some people who use it every day, while others refer to it only occasionally. Among the companies that find diffraction analysis most useful are those producing alloys, pigments, soaps, catalysts, ceramics, and chemicals. At present there is only a small amount of data on organic compounds, although this type of analysis is generally quite satisfactory for most organic materials. When a regular program for amassing data is established, the hope is that contributing laboratories will keep the schedule filled.

NIXES FOR NIPS

Reparations surveys recommend dulling Japanese sabers, and lessening our burden.

THE REPORTS of the United States Reparations Mission to Japan (the Strike Report) and of Edwin W. Pauley, seem to confirm the G.I. opinion of the Japanese: they are industrious and resourceful, but horribly inefficient by our standards. However, to prevent die-hard jingoists from directing the abilities of the people toward another Greater East Asia Co-Prosperity Sphere, all primary war facilities and certain chemical capacity above that necessary for economic recovery are recommended for reparations. Nitrogen fixation; nitric acid production; sulfuric acid production; soda ash, caustic soda and chlorine production; calcium carbide production; and coal tar distillates and intermediates are the most important basic chemical industries.

For fertilizer requirements of ammonium sulfate, Japan needs about 2 million tons per year. Although only about ¾ million metric tons (MT) were produced in 1946, it is estimated that available facilities (for production of both calcium cyanamide and ammonia) could yield the equivalent of 2¼ million MT. This would leave little for reparations, but it is recommended that any plant that does not reach maximum capacity in a reasonable time be summarily seized as war strength reserve.

In 1943, it is estimated that Japan hit a peak production of 100% nitric acid of 250,000 MT. Legitimate peacetime uses are put at 12,500 MT annually. For this, only one plant limited to that production is necessary, and 9 plants with a probable capacity of about 240,000 MT per year would be available for removal.

Sulfuric the Backbone

Japan's sulfuric industry is 86 plants comprising 177 units of which 117 are the chamber type and 60 contact. Estimated production is about 4¾ million MT of 50° Baumé acid per year. The highest the Japanese ever hit was a little over 4 million. Although it

had been felt that 3½ million MT per year was safe, and that production above that should be reparations in the form of contact plants, now it is recommended that all be left in the islands for fertilizer production and as the backbone of necessary industry.

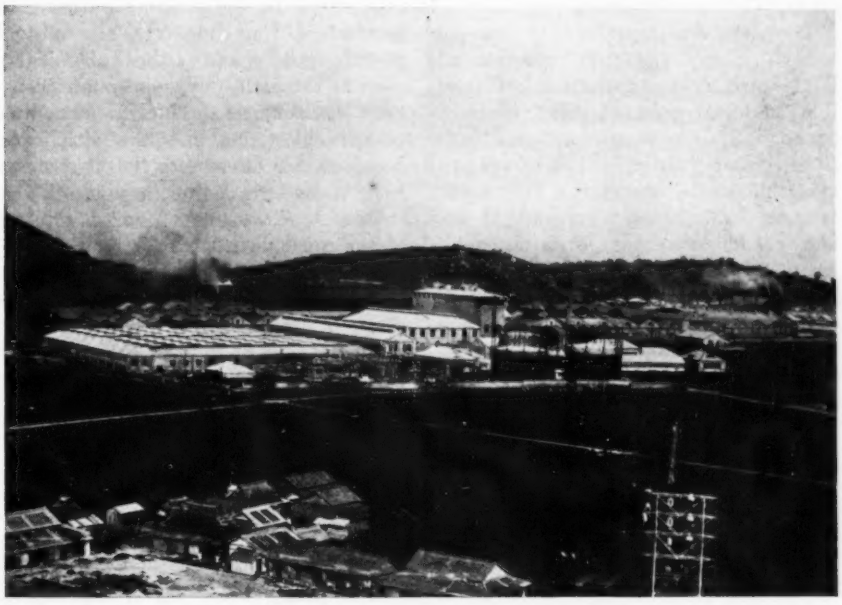
Pauley concludes that soda ash plants in excess of a capacity of 300,000 tons a year should be removed. This would allow capacity of about ½ million tons for reparations. The Strike Report lists about ½ million MT to be retained, with none for reparations.

Some disparity between the reports is evident in the recommendations for caustic soda. Strike's group finds about 46,000 MT caustic soda available for reparations after retaining 82,500 MT. Pauley finds that capacity for producing 195,000 MT caustic soda and 175,000 MT chlorine will be available after providing 44,000 MT caustic and 40,000 MT chlorine for needed industry.

Calcium carbide plants are not recommended for reparations. Only equipment for production of tar distillates and intermediates that will become surplus as a result of removal of such war potential as steel and oil installations is marked for the spoils pile.

No Second Pearl Harbor

Although there is some variation between the two surveys, they are in fair agreement as to the size and allocation of the industry. The Strike Report lists capacities available for removal in strict accordance with controlling directives, and then makes recommendations that only primary war facilities be removed. Both reports stress the necessity of getting Japan off our back while we make sure she won't stab us in it again.



JAPAN: Samurai swords into sulfates.

CLOUDY WATER

A newly-patented device uses differential light absorption to guage suspended solids.

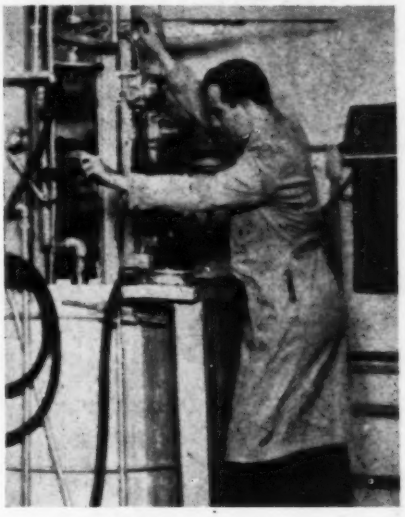
IN THE MAKING of paper and other fiber products, the pulp is deposited from a very dilute suspension. There are usually a few old fellows around the mill who have had ten or twenty years' experience in telling whether the suspension is too thick, too thin, or just right. But even the best of them can't tell very closely.

That's why papermakers are studying U. S. Patent No. 2,437,715, issued recently to Clark E. Thorp of Armour Research Foundation and assigned to Hawley Products Co. The patent describes a device which measures and automatically controls concentration.

Pure Enough to Drink

This isn't the first tool ever designed to do the job. Previous ones, however —which measured the light absorption, viscosity, or density of the suspension —were not accurate for less than 1 per cent suspended solids; and some of the pulp suspensions used in practice are in the range of 0.001 to 0.25 per cent—only half as turbid as Chicago tap water.

The new instrument carries out its duties by means of light and electronics. Light is passed through the pulp suspension, actuating a photocell. Another beam is passed through the make-up water, registering its absorption on another photocell. The cells are connected to a wheatstone bridge in such a manner that the light absorption of the make-up water is subtracted from that of the pulp suspension. The difference—now in the form of electrical energy, the light having been converted into an electric current by the photocells—represents the absorption by the pulp alone. The electrical energy operates a valve through an electronic circuit, controlling the "consistency" (per cent solids) of the suspension to a predetermined level. The suspension medium may vary in turbidity and color, but this meter—unlike those with only one photocell—takes that into account.



CLARK E. THORP: The consistency is consistent.

The old "rule of thumb" method is subject to errors of plus or minus 10 per cent. The new device is accurate within 3 per cent on higher consistencies, and the errors at lower levels are not measurable by ordinary methods.

Other Uses Foreseen

Thorp thinks that other industries may find the consistency control device useful. In decanting supernatant liquids, for example, the new machine could tell in a flash when solid particles started to come out—long before the eye could tell. Wherever solids are suspended, in fact, the device affords a method of measuring the concentration within a very narrow range. Thorp foresaw its broad possibilities when he applied for the patent; for while he admitted that it was "particularly useful in controlling the consistency . . . of a mixture of liquid and fibers," it was "not limited thereto."

A CI REPORT ON

SYNTHETIC CHEMICALS FOR AGRICULTURE

Part 1: Fertilizers and Insecticides

*by R. H. WELLMAN**

Rohm & Haas Co.

TEN YEARS AGO synthetic organics accounted for less than two per cent of the 80 million dollars worth of chemicals used in American agriculture. Last year DDT and 2,4-D alone turned in sales of close to 30 million dollars. Here is an up-to-date picture of this fast-growing branch of the synthetic organic chemicals industry—an authoritative discussion of products, properties, manufacturers and markets, plus a look at some of the prospects. What the future holds is important to a large sector of the chemical industry.

A FULL appreciation of the importance of agriculture to the national economy can be gained by comparing the income from agriculture with the total income of the country. According to Department of Commerce figures, the national income in 1946 exceeded 178 billion dollars, of which 18.2 billion dollars represents income derived from farms. Thus one-tenth of our entire income comes directly from agriculture. All the manufacturing industries put together return only two and a half times as much as farming. Estimates of 1947 income show agricultural income running at 22 billion dollars from a total income between 200 and 250 billion.

Ten years ago synthetic organic chemicals used in agriculture accounted for less than 2% of the 80 million dollars worth of chemicals sold to the agricultural insecticide and fungicide industry. This is exclusive of fertilizers which would place the synthetic organics in a still lower position. No organics were selling in the volume of such materials as lead arsenate and copper sulfate at 60 million pounds each, sulfur at 110 million pounds, or creosote oil at 175 million pounds.

The situation is radically changed today. Some 48,000,000 pounds of DDT were produced during 1947 and this material sold at fifty cents a pound. There was some holdover from this production. Figures are unavailable as to how large this holdover was and the calculations that follow assume that it was all sold. About 6,000,000 lbs. of 2,4-D were sold at a price averaging $.80 per pound. Of course, a portion of the DDT was used in mosquito control, and a portion of the 2,4-D in controlling weeds in lawns.

These two chemicals alone account for a large portion, about 15%, of the estimated 200 million dollars worth of chemicals sold for agricultural uses during 1947, and this figure is equal to nearly 40% of the total market of 1939. The recent price drop of DDT to 29 cents a pound may lessen the dollar volume of DDT sold in 1948, though its more extensive use may balance the lower price. In any event, this should be more than offset by the sale of 2,4-D, which some authorities estimate will, in time, total 100 million pounds per year. Other chemicals, such as tetraethyl pyrophosphate, benzene hexachloride, chlorinated camphene, chlordane, and the dithiocarbamates, are all new to the field since 1939 and all are selling in volume.

The expansion of the dollar volume of the agricultural market in the last ten years does not represent inflation to any great extent. In 1937 the Bureau of Labor's price index for all chemicals was 88, and in 1947 this had risen to only 118. Thus if agricultural chemicals have risen in the same proportion, the present day value of the agricultural chemicals sold in 1937 would be 108 million dollars.

WHY THE INCREASE?

There are at least six reasons why there has been such an increase in the use of chemicals in agriculture and

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why it is reasonable to assume that this expansion will continue:

(1) Weeds, insects, and fungi probably cost the American farmer some five billion dollars a year. (Some estimates have placed this value as high as 13 billion dollars but it is felt that these are the result of pyramiding and are excessive). The farmer can well afford to spend one billion dollars to alleviate ¾ of this damage. Thus, as new chemicals are found that fit a use for which there was previously no solution, more chemicals are made.

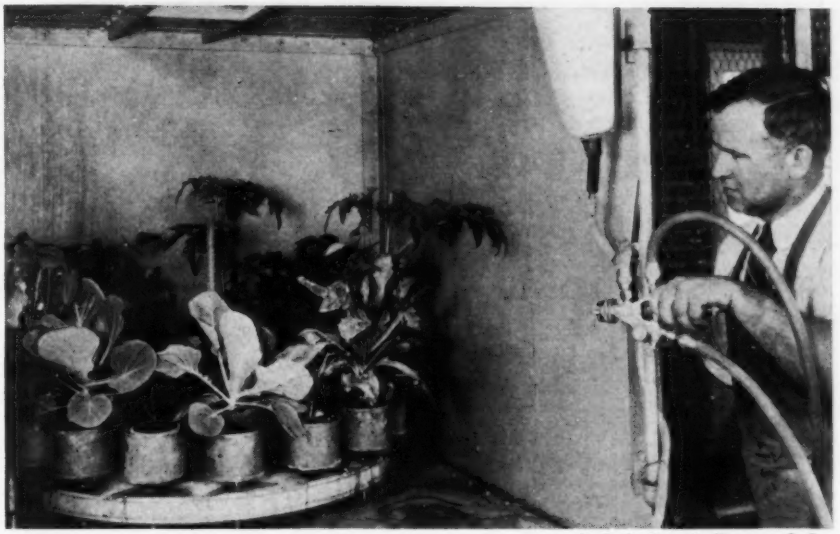
(2) The population of the United States has increased by fourteen million people in the last decade. We are called on to make up the food deficit of western Europe, and the world as a whole is undernourished. The combined effects of war's destruction and increased population will not be offset in the immediate future by any corresponding increase in the acreage of arable land. We must use what land we have to produce the utmost food. We cannot afford to lose food destined for human consumption to insects, diseases, or weed competition. We must wage an increasingly more effective and intensive chemical war against these starvers of mankind.

(3) Labor costs are going up in farming perhaps more sharply than in most other fields. The farmer now has to compete with industry in the same labor market. No longer is his hired hand isolated and unaware of the short hours and high pay of the assembly line. The replacement of the hoe by a chemical weed-killer is a more urgent goal today than ever before.

(4) The American public is increasingly more quality conscious. In order to obtain the premium prices that quality products command, the farmer must make sure that his produce does not have defects caused by insects or diseases.

(5) Advantage is being taken of the specificity of action of some of the new chemicals. Thus the new chemicals for control of mites "Neotran" and di(2-ethylhexyl)phthalate which are just entering commercial usage, are said to be so slightly toxic to warm blooded animals as to have no toxicological hazards as used. Yet these materials are more effective than the previous chemicals used for this purpose. Specificity of toxic action properly directed will allow for control of diseases and insects under conditions that are now impractical.

(6) Concurrent with the tremendous growth of our chemical industry many new organic chemicals are commercially available for the first ime. So, the economically feasible building stones for developing new and effective materials have increased tremendously.



E. I. du Pont de Nemours & Co.

Testing new insecticides. All of the largest volume synthetics are new since 1939.

Let us now define the field in which we are interested. We will comment briefly on some of the newer fertilizer developments. We shall consider in some detail the chemicals which have a toxic action on some form of life—insecticides, fungicides, and weed-killers in particular. Also to be considered is the newer field where advantage is taken of some physiologic action of the chemical, for example, the treatment of apples with the methyl ester of naphthalene acetic acid to delay the formation of an abscission layer in the stem of the fruit and consequently hold it on the tree until it is riper, redder and juicier.

Of course, some chemicals are going to fall in both classes: 2,4-D keeps the apples on the tree, but if wrongly applied, it deforms next year's foliage at the same time. A better example of its beneficial action is its use to set seedless fruit. A very dilute spray of this material has the same effect on tomatoes as pollenization—the production of fruit is stimulated. However, since fertilization has not actually taken place, the fruits are seedless. The application of 2,4-D as a weed-killer is just taking advantage of its remarkable physiological action on the plant. When sprayed on the leaves of many broad-leaved plants, it is absorbed by the plant and stimulates the plant's metabolism until its reserve food supplies are exhausted; concurrently, there is swelling and distortion of the underground portions, which eventually become soft and spongy and disintegrate.

The new insecticides will be taken up in this first article and some attention will be given to fertilizers. A subsequent article will be devoted to fungicides, herbicides, and other chemicals. The experimental work has been so extensive, and the results in some cases so contradictory, that it is not possible to attempt complete coverage of the field. Rather, the present paper merely presents thumb-nail sketches of the new materials and attempts to outline their major fields of usefulness as well as some of their disadvantages. So many people have contributed to the advance of this field in recent years that any adequate list of literature cited would exceed in length the paper itself and hence must be omitted. The reactions used in a method of manufacture are given in the discussions of the newer chemicals in those instances where this information is public knowledge. A table has been compiled for each section that shows prime manufacturers of the chemicals discussed. It is not claimed that these tables are complete, for in addition to the unintended but customary oversights, new manufacturers are constantly entering the field.

Some reports of the toxicity of these materials to warm-blooded animals are included. In general these reports are on the pure chemical and not on the diluted sprays or dusts which are applied in agriculture. Chemicals that are poisons can be safely and advantageously used provided proper precautions are taken.

FERTILIZERS

Fertilizers in general represent a high volume, low unit cost business that has been relatively stable in the types of chemicals used over the last 20 years. Lime, soluble nitrogen compounds, phosphates, and potassium salts are used in huge tonnages. For example, in 1944 over 33 million tons of fertilizers were used in continental United States.

There have been few changes in the kinds of chemicals used in this field, and no major ones are contemplated for the immediate future. The minor element fertilizers may be the excep-

E. I. du Pont de Nemours & Co.

Determining the effectiveness of chemical control of codling moths on apples.

tion. For example, The Florida Everglades, now one of the primary winter vegetable areas in the country, gave complete crop failures until copper salts were applied. As little as 25 lbs. of copper salts per acre made the difference between failure and success. Manganese, zinc, and boron are also being added in areas where they have been shown to be limiting factors in plant growth. Many of these are now being applied as sprays directly to the leaves. This development has come concurrently with the realization that plants are able to absorb many materials directly through the leaves and transport them.

It will be seen that the application of materials to the leaves instead of the soil provides much more efficient use of the chemical because in the soil so much is leached out or fixed before the plant can make use of it. Zinc sulfate, at the rate of ½ lb. per tree, corrects the deficiency disease of apples known as little leaf, but it takes 15 pounds of this material applied via the soil to accomplish the same purpose.

If ways could be found to apply the major elements, nitrogen, potassium and phosphorus to the foliage, they could be applied just when needed by the plants. An extra boost could be given if the market justified it. Synthetic chemicals may furnish the means to do this because appropriate chemicals provide just the right degree of solubility so that a little fertilizer would be available to the plant each day. Chemicals that would not be injurious to the foliage must be found. A start has already been made in the field with the use of urea as a spray to fertilize city shade trees where concrete walks and streets make root fertilization a particular problem. The possibilities of the use of insecticides and fungicides that have fertilizer value is being explored.

INSECTICIDES

There are approximately 5,000 different kinds of insects causing economic loss in the United States. At least 200 of these can be considered major pests. Estimates of the loss caused by insects vary between one and two billion dollars a year, in spite of all current control methods. How much more severe they would be without current control can be illustrated by control work on grasshoppers. In the decade starting in 1936, $25,000,000 was spent in grasshopper control and resulted in a prevention of crop damage estimated to result in a saving of $600,000,000.

The intensive search by industry for better insecticides, and the expansion of this search by the government during the war have brought many new insecticides into commercial usage in the years immediately succeeding the war. Our country has not been alone in the discovery of new insecticides. Many of the important new compounds were first discovered to have active insecticidal properties in Europe. Even here with these compounds this country has played an extremely important role in outlining their usefulness and in their commercial development. The following discussion will deal largely with the new materials, most of which have not yet found their maximum market.

DDT

DDT—dichlorodiphenyl trichloroethane—is made from monochlorobenzene and chloral:

$$2C_6H_5Cl + OCHCCl_3 \rightarrow (C_6H_4Cl)_2CHCCl_3 + H_2O$$

While DDT may not have been the trigger that set-off the current expansion in the use of chemicals in agriculture, it unquestionably stimulated this expansion. Here was the first example of a synthetic organic chemical that had a wide range of usefulness and that could, by virtue of its effectiveness, compete with and displace inorganics, which were cheaper on a poundage basis. In addition, its effectiveness opened up fields, such as the spraying of range cattle to eliminate horn flies and lice, where no chemical was used before.

It was first made by Zeidler in Germany in 1874 and was discovered to have insecticidal action about 1937 in Switzerland. It was found to be very effective against the body louse in this country and was extensively used against body lice and as a mosquito larvacide during the war. It was the first chemical to have residual contact action sufficiently great enough to be useful. Residual contact action means that an insect can be killed simply by walking over a dried sprayed surface.

DDT has found widespread use as a household insecticide. Its effectiveness against leaf-hoppers on potato has been said to be a major factor in the surplus of potatoes produced in 1946.

The tremendous newspaper publicity that accompanied the development of DDT and its spectacular successes in certain fields have made the farmer very conscious of the possibilities that may exist for him with new materials. His willingness to accept change often is not tempered by a desire to try new things on a small scale first. He may thus become equally disillusioned by his own ill-advised failures and turn his back on new developments. Man-

ufacturers must be sure of their ground before rushing headlong into new developments that may backfire and by so doing delay the acceptance of the truly worthwhile advances that are being and will be made.

The recent drop in prices of DDT to 29 cents a pound for technical grade is believed to be an indication that the current markets are less than the current production capacity. In spite of the intensive research on this material within the last five years, it is considered unlikely that all the potential markets for DDT are yet filled. For example, a combination of DDT, benzene hexachloride, and sulfur is entering its first big year in the cotton insect control program.

While DDT is not by any means the most toxic to warm-blooded animals of the insecticides now in use, it is stored in fatty tissues. An animal fed high levels of DDT in the diet can accumulate enough in its fat to harm itself if it goes through a period of quick weight loss. Wisely, the use of DDT on animal forage has been discouraged since it has been found that it can be carried through to the milk, where it is concentrated in the butterfat. DDT is not as readily removed from fruits by washing as is lead arsenate, although methods are being worked out for its removal.

DDT also furnishes a good example of one of the disadvantages of the introduction of new insecticides. They frequently lead to a change in the major pests involved. For years the major insect problem on apples has been the codling moth. In some areas 12 or more sprays of lead arsenate per season were applied without attaining complete control. With the advent of DDT, excellent control of codling moth has been attained with three sprays per season. There is hope that the moth population can be so far reduced that one spray will give adequate control of this pest. But European red mite is on the increase; in many sections it is now a worse pest than the codling moth ever was. This is not because DDT is so much less toxic to the mites than was lead arsenate. One explanation is that DDT is much more toxic to the predators of the European mite. Thus, with its natural enemies eliminated, the mite can go ahead and multiply in peace. There has also been speculation about whether the DDT changes the plant itself, making it a more favorable host for the mites.

Another apple pest that was scarcely heard of before was the red-banded leaf roller. In certain localities there have been epidemic outbreaks of this pest in the last two years. This has been attributed to the fact that DDT is not as toxic to this insect as lead arsenate, although this theory remains to be proved. So the introduction of one new insecticide has led to an even more intense search for other insecticides to control the insects the first material encourages. The answer may be either in using a material to kill mites in conjunction with DDT, or in finding a material that will kill all the pests of a given crop.

DDT remains in the soil for long periods of time either as DDT itself or some partial decomposition product. The possible accumulation of soil residues to levels toxic to plants is now being investigated. Greenhouse work has shown that the chlorinated hydrocarbons when added to the soil cause a checking of growth of many crops that have no obvious symptoms of injury. If this also occurs in the field and leads to reduced yields, it could become a serious problem because, being symptomless, it would be hard to detect where no untreated areas existed for comparison.

DDT has been discussed in some detail because its wide usage has brought up problems similar to those which may be expected with other new materials. The rapidity with which these problems can be solved and correct usage of new chemicals be ascertained will largely determine how rapidly the market will expand.

DDT is supplied to the consumer either as a dust, a wettable powder, in emulsifiable form, or in solution. Dusts contain from 1% to 50% DDT, wettable powders usually 50% DDT, and emulsifiable DDT in a 20% to 50% concentrate. DDT in solution reaches the consumer mostly in houshold insecticides that contain from 3% to 10% DDT. Its waxy nature has made the preparation of finely divided dusts

TABLE I—SOME PRIME MANUFACTURERS OF THE NEWER INSECTICIDES
(Arranged in the order in which they are discussed in the text.)

Chemical Compound	Common Name*	Prime Manufacturer
p,p'-Dichlorodiphenyl trichloroethane	DDT	Du Pont, Dow, Stauffer, Westvaco, Penn Salt, J. T. Baker, Merck, General Chemical, Michigan Chemical, Monsanto, Montrose, Cincinnati Chemical Works, Hooker
Dichlorodiphenyl dichloroethane	TDE or DDD	Rohm and Haas
Bis(methoxyphenyl) trichloroethane	Methoxychlor	Du Pont
Benzene hexachloride	Benzene hexachloride	J. T. Baker, Du Pont, Commercial Solvents, Westvaco, Penn Salt, Hooker
Chlorinated bicyclo terpene	Toxaphene	Hercules Powder
(See text)	Chlordane	Velsicol, Julius Hyman
Tetraethyl pyrophosphate	TEPP	Victor, Monsanto, Cal. Spray, Westvaco, Eston
O,O-Diethyl *p*-nitrophenyl thiophosphate	Parathion	American Cyanamid
Isobutyl undecylene amide		Du Pont
(See text)	"Piperonyl Butoxide"	U. S. Industrial
(See text)	"Piperonyl Cyclenone"	U. S. Industrial
(See text)	"Propyl isome"	S. B. Penick
Isobornyl or fenchyl thiocyanoacetate	"Thanite"	Hercules Powder
beta-Butoxy-beta-thiocyanodiethyl ether	"Lethane 384"	Rohm and Haas
2,4-Dinitro-*o*-cresol		Du Pont, National Aniline Standard Agricultural Chemicals
Dicyclohexyl amine salt of 2,4 dinitro-6-cyclohexylphenol	"DN-111"	Dow
Bis(p-chlorophenoxy)methane	"Neotran"	Dow
Di(2-ethyl hexyl) phthalate	DOP	Carbide and Carbon, Ohio-Apex
Phenothiazine	Phenothiazine	Dow, Du Pont, General
Diphenyl amine		Dow, Du Pont, Eastman, Fine Organics, Monsanto
Diphenyl(or biphenyl)		Monsanto
Ethylene dichloride		Carbide and Carbon, Dow
Methyl bromide		Dow, Du Pont, Michigan Chemical, Pittsburgh Chemical
Ethylene dibromide		Dow, Ethyl-Dow, Michigan Chemical, Westvaco
Acrylonitrile		American Cyanamid, Dow, Du-Pont, Rohm and Haas
Chloropicrin		Dow
beta-Methyl allyl chloride		Shell Chemical
Ethyl formate		Commercial Solvents, U. S. Industrial
1,1-Dichloro-1-nitroethane		Commercial Solvents
2-Ethyl hexanediol-1,3	"6-12"	Carbide and Carbon
Dimethyl phthalate		American Cyanamid, Du Pont, Kay-Fries Chemicals, Monsanto
alpha, alpha-dimethyl-alpha-carbutoxy-gamma-pyrone	"Indalone"	U. S. Industrial
Cyclohexyl cyclohexanol		Dow
o-Phenyl cyclohexanol		Dow

*Trade name is used when the product is marketed by one manufacturer and has no common name.

or wettable powders difficult, but this problem has been adequately solved by the formulators.

DDT can exist in a number of isomers. Of these the most potent insecticidally is the para, para-isomer, and manufacturing conditions are now conducted in such a manner as to achieve a maximum production of this isomer. The technical grade usually used for insecticides has a setting point of at least 89°C. and has a considerable amount of the ortho, para-isomer as an impurity. The purified

Hercules Powder Co.

Considerable progress has been made in keeping blood-sucking flies off animals.

or aerosol grade contains at least 90% *p,p'*-DDT and has a setting point of at least 103°C. Pure *p,p'*-DDT has a melting point of 108.5 - 109°C.

The usefulness of DDT has, of course, stimulated research in the field of chlorinated hydrocarbons in a search for other effective insecticides. Five of these are now on the market. They are dichlorodiphenyl dichlorethane, bis(methoxyphenyl) trichlorethane, benzene hexachloride, chlorinated camphene, and chlordane. A short discussion of each follows. Incidentally, the names benzene hexachloride, chlorinated camphene, chlordane, methoxychlor and parathion have been established by a committee and are contraction designations adaptable to common usage in place of the full chemical names. In addition to simplicity, these common names avoid the confusion that a multitude of initial or number designations cause.

TDE OR DDD

TDE—dichlorodiphenyl dichloroethane—may be prepared by passing chlorine into ethanol with the resultant formation of a mixture of $Cl_2CHCH(OC_2H_5)_2$, $Cl_2CHCHCl(OC_2H_5)$ and a small amount of $Cl_2CHCH(OH)_2$. This mixture is then condensed directly with chlorobenzene to yield $(ClC_6H_4)_2CHCHCl_2$, i.e., TDE.

This material seems to be less injurious to corn than DDT and has been used for the control of the corn borer. It has not as yet found a wide market.

METHOXYCHLOR

One method of making methoxychlor — bis(methoxyphenyl)trichlorethane— is by reacting methyl chloride or dimethyl sulfate with sodium phenate to produce anisole which is then reacted with chloral:

$$CH_3Cl + NaOC_6H_5 \rightarrow CH_3OC_6H_5$$
$$2CH_3OC_6H_5 + OCHCCl_3 \rightarrow (CH_3OC_6H_4)_2CHCCl_3$$

Substituting the $-OCH_3$ groups for the -Cl groups in para positions of DDT makes a compound which is claimed to be approximately twenty times less toxic to warm blooded animals than is DDT and yet on certain insects is just as effective. It is also said to have greater "knockdown" properties than DDT. Methoxychlor is more effective than DDT in the control of Mexican bean beetle and is finding a market for this purpose. It is also being extensively investigated on livestock pests.

BENZENE HEXACHLORIDE

Benzene hexachloride — 1,2,3,4,5,6 hexachlorocyclohexane— may be prepared through addition chlorination of benzene under appropriate conditions:

$$C_6H_6 + 3Cl_2 \rightarrow C_6H_6Cl_6$$

It was first prepared by Faraday in 1825 and was tested in this country as early as 1935 and discarded as ineffective. It was picked up again in France in 1941 and independently in England in 1942. It was missed here because of its remarkable specificity. It exists in a number of space isomers, the gamma isomer (melting point 112.5°C.) being the only effective insecticide. The beta isomer, which was tested here, is completely inactive. The commercial product is a crude usually varying between 5 and 20% gamma isomer content. Limited quantities of a technical grade containing about 90% gamma isomer are being produced. The content of gamma isomer is specified and is a measure of the effectiveness of the product. One explanation of its activity has been its possible replacement of the essential metabolite inositol $C_6H_6(OH)_6$ to which it bears a structural similarity. It has a distinct and pervading musty odor, which limits its use on food products and on fruits and vegetables too close to harvest.

Benzene hexachloride is more volatile than DDT and for this reason can exert a fumigant action under certain conditions. This greater volatility probably accounts for its shorter period of effectiveness under field conditions compared to DDT. The gamma isomer is about as toxic to humans as DDT. Although its range of effectiveness is less than DDT it controls certain insects that DDT does not. Its use on cotton insects in combination with DDT and sulfur has already been mentioned. It has been successfully used against aphids and plum curculio. Perhaps its most startling success has been in control of wireworms. As little as one pound per acre of the gamma isomer has successfully eliminated wireworms from the soil. Caution must be exercised in the application of benzene hexachloride for the control of wireworms since certain crops, such as potatoes, may develop an off-flavor when grown on benzene hexachloride-treated soil. It is felt that it may become too easy to explain all off-flavors in potatoes as a benzene hexachloride effect when it is known that there are numerous environmental conditions which cause similar off-flavors. Off-flavors have also developed when benzene hexachloride has been sprayed on many vegetables; an example is peas.

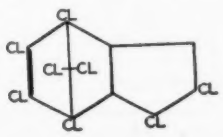
CHLORINATED CAMPHENE

Chlorinated camphene is a material presumably made from the chlorination of a terpene or mixture of terpenes and is described as a chlorinated bicyclic terpene. It is being used on cotton where it controls insects that calcium arsenate does not. What share of the market will be taken by chlorinated camphene and what by the

DDT-benzene hexachloride-sulfur combination remains to be seen. In the immediate future it looks as though both will be used. Substantial increases in yield of cotton and cottonseed have been reported in experimental trials.

CHLORDANE

Chlordane—1,2,4,5,6,7,8,8-octachloro-4,7 - methano-3a,4,7,7a-tetrahydroindane—has the formula:



It has been very successful in combating locust and cricket invasion. Both chlordane and chlorinated camphene have been spectacularly successful against cockroaches and ants. Together with the remarkable effectiveness of DDT against bedbugs these developments have caused exterminators to wonder if they are working themselves out of business. No longer do reinfestations occur within two weeks to make a return call necessary. One thorough treatment with the appropriate chemical will often eliminate the pests for 3 months.

The insecticidal and toxicological properties of these chlorinated hydrocarbons are sufficiently different from one another to make it appear that they will all find an increasing use in agriculture. Extensive experimentation is now being carried on with all of them, but investigators are not yet willing to make recommendations for a large portion of their potential uses.

Another group of compounds that contains potent insecticides is the organic phosphates. These compounds were discovered even more recently than were the group just discussed. The outstanding representatives are tetraethyl pyrophosphate and parathion.

TEPP

Tetraethyl pyrophosphate is thought to have the following structure: $(C_2H_5O)_2PO\text{-}O\text{-}PO(OC_2H_5)_2$. It is now thought that the activity of what has been called hexaethyl tetraphosphate (HETP) is in reality due to its tetraethyl pyrophosphate content. A recent article states that there are two materials having the composition $(C_2H_5)_4P_2O_7$, one of which is distillable and the other not. It is concluded that the distillable tetraethyl pyrophosphate is the insecticidally active ingredient. This distillable material was obtained at 104° to 110°C. and 0.08 mm. pressure and is a water-white liquid. The commercial product is an amber hygroscopic liquid that can be prepared by the reaction of phosphorous oxychloride and ethyl alcohol or by the reaction of phosphorous oxychloride and triethyl phosphate as shown below.

$$5\ (C_2H_5)_3PO_4 + POCl_3 \rightarrow 3\ C_2H_5Cl + 3(C_2H_5)_4P_2O_7$$

The product is not a pure chemical. Manufacturing processes are now so conducted as to insure a maximum yield of this material. This year the active ingredient on the label of either material will be expressed in terms of its TEPP content. It is furnished to the trade as a residual product usually with emulsifying and coupling agents already added. The insecticidal properties of what was thought to be HETP were discovered in Germany during the war. Workers in this country have found TEPP to be four or five times more active than the product called HETP. TEPP has been used successfully to control aphids, thrips, and mites. It is essentially a replacement for nicotine, which has been in short supply. While it is extremely toxic to insects, in water it hydrolyses rapidly to inactive materials, so that dilute aqueous solutions may lose an appreciable portion of their effectiveness if held for longer than two hours.

TEPP is highly toxic to humans and is readily absorbed through the skin, making special handling precautions necessary. Fortunately, its hydrolysis products are much less toxic so that there is little residue hazard.

PARATHION

Parathion—O,O-diethyl-*p*-nitrophenyl thiophosphate—has also been called "3422", "Thiophos", and "E605". Parathion may be made by reacting sodium ethylate and thiophosphoryl chloride to give diethoxy thiophosphoryl monochloride which is reacted with sodium para-nitrophenate in chlorobenzene.

$$2\ C_2H_5ONa + PSCl_3 \rightarrow (C_2H_5O)_2PSCl + O_2NC_6H_4\text{-}ONa \rightarrow (C_2H_5O)_2PS\text{-}O\text{-}C_6H_4\text{-}NO_2)$$

It was discovered in Germany during the war as an extension of the work on war poisons. The first public report on this compound was given in a British Intelligence Objectives Report in 1946.

It is five to twenty times as toxic to insects as DDT, depending on the insect, and controls a much wider range of pests than does DDT. In entomological circles it is currently receiving the attention that DDT once did. As a pure chemical it has a noxious odor, which does not, however, persist in the field. It is reported to be several times as toxic to humans as DDT, but, since it is moderately volatile, it does not remain on foliage in the field longer than a week and supposedly leaves no residue problem. There is some question about its absorption by the plant, due to reports of systemic toxicity of plants which have been sprayed only in part. It is readily adsorbed through the skin and thus is a hazardous material to handle in the undiluted form. It is to be offered to the consumer as a greatly diluted wettable powder.

For comparison, here are some values, obtained on roaches of the relative toxicity of these chemicals together with some of the older standards. The values given are milligrams of chemical per gram of roach necessary to give a median lethal dose (one which will kill half the roaches). They are: nicotine 0.125, HETP 0.125, "Toxaphene" 0.04, TEPP 0.028, DDT 0.01, chlordane 0.005, pyrethrins 0.008, parathion 0.0006. In this test parathion was nearly 20 times as toxic as DDT. Of course, if a different insect or a different testing technique had been used, these materials might well have been rated in a different order.

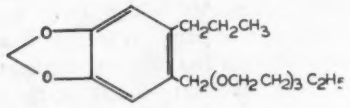
PYRETHRUM EXTENDERS

In the comparison of toxicities shown above it will be noted that pyrethins, which are the insecticidal ingredients of pyrethrum flowers, are as toxic as DDT. Since, on a pyrethrin basis, pyrethrum ordinarily retails for $30 a pound, it is not a serious competitor of the synthetic chemicals we have been discussing. Pyrethrum still has a place because it has the unique characteristic of quickly immobilizing insects. Most of the synthetics discovered so far have no paralyzing effect on insects within ten minutes after application, even at concentrations many times higher than those which will lead to ultimate death of the insects. Pyrethrum, on the other hand, will stun flies at lower doses than those necessary for killing effect. In many applications, such as household fly sprays, this is a tremendous advantage. Most fly sprays now have pyrethrum or a thiocyanate for "knockdown" and some synthetic for kill.

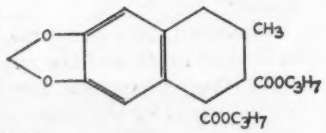
A great deal of effort has gone into attempting to extend the effectiveness of pyrethrum by the use of other compounds in order to obtain the same results more inexpensively. These extenders are not usually potent insecticides in themselves; they enhance the insecticidal action of pyrethrum in ways not thoroughly understood. Isobutyl undecylenamide was the first widely used pyrethrum extender. It has now been largely replaced by compounds of the methylenedioxyphenyl class. The synthetic members of this group are most readily obtained from safrole or isosafrole. "Piperonyl Bu-

toxide", "Propyl Isome" and "Piperonyl Cyclenone" are the best known synthetic derivatives. Their formulas are:

"Piperonyl Butoxide"

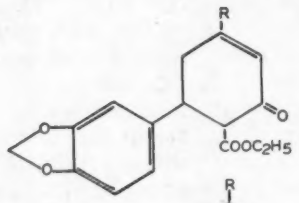


"Propyl Isome"

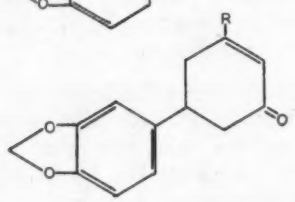


"Piperonyl Cyclenone"

(R is an aliphatic group and may presumably be either hexyl or amyl)



AND



"Piperonyl Butoxide" is offered to the trade as a technical product containing 80% 3,4-methylene-dioxy-6-propylbenzyl (butyl) diethylene glycol ether. It boils at 180° at 1 mm. Hg, is said to be practically non-toxic to warm-blooded animals and is soluble in all common organic solvents.

Sesamin from sesame oil and piperine from pepper are naturally-occurring members of this group which are effective.

The addition of a small percentage of "Piperonyl Butoxide" to a fly spray will allow a three- to four-fold reduction in pyrethrin content without any reduction in knockdown of flies.

ALIPHATIC THIOCYANATES

This was one of the first groups of synthetic organic chemicals to find wide use in the insecticidal field. Members of this group are not particularly toxic to humans and are effective against many insects, particularly greenhouse pests or flies. Certain members in relatively high concentrations possess "knockdown" properties similar to pyrethrum, which lead to their use as livestock fly sprays. The most widely used have been "Thanite", which is fenchyl or isobornyl thiocyanoacetate, and the "Lethanes". The active ingredient of "Lethane 384" is a mixture of β-butoxy-β-thiocyanodiethyl ether and other thiocyano ethers. It is sold as a 50% solution in a petroleum distillate. The use of DDT has curtailed the demand for the thiocyanates as livestock sprays.

DINITRO COMPOUNDS

This group of compounds also contains members which are fungicides and others which are herbicides. One of their uses is as dormant sprays on apple trees, where they have been particularly effective against aphid eggs. One of the first to be used was 2,4-dinitro-*o*-cresol. The best known insecticidally is the dicyclohexylamine salt of 2,4-dinitro-6-cyclohexylphenol. This compound is the active ingredient of "DN-111", which is a wettable powder containing 20% of the toxicant. It has found wide use in controlling mites, which, as mentioned above, are becoming increasingly serious pests of fruit trees. "DN-111" kills the adult mites but not the eggs, and under certain weather conditions has produced severe plant injury. A very active search for chemicals that will kill mite eggs is underway in the industry. The build-up of mites following the use of DDT has further stimulated this search. The advantage of such materials is that by killing the eggs the population of mites can be permanently reduced.

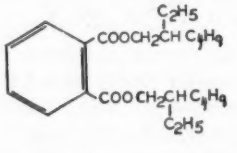
TWO NEW CHEMICALS

"Neotran" — bis(p-chlorophenoxy) methane—has been used against mites affecting citrus in California and against the mite pests of apples. It is claimed to be toxic to both eggs and adults. "Neotran" is reported to be about 1/10 as toxic as DDT to warm-blooded animals, and not readily adsorbed through or particularly irritating to the skin. The formula for the toxic ingredient is:

$$ClC_6H_4OCH_2OC_6H_4Cl.$$

It is offered for sale as a wettable powder containing 40% active ingredient.

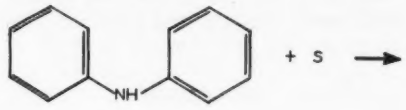
Di(2-ethyl hexyl)phthalate has the formula:

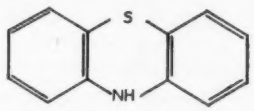


It has shown promise in limited field trials against mites on citrus and on apples. It also kills both eggs and adults. An advantage this material has is its low order of toxicity to humans. The ideal insecticides of the future will be selected with as much view to being innocuous to humans as to being effective against insects. Di(2-ethyl hexyl)phthalate is reported to extend the length of time DDT remains active as a residual spray.

PHENOTHIAZINE

Phenothiazine can be prepared from diphenyl amine and sulfur with a suitable catalyst:





This chemical, one of the first of the organics to be introduced as a foliage insecticide, was found to have considerable effectiveness in controlling codling moth on apples. Because of difficulty in obtaining normal fruit color, and because it had no marked advantage over insecticides already used, it never found a wide market for this purpose. It is, however, a boon to agriculture through its effectiveness as an anthelmintic for such internal pests as the nodular worm in sheep.

DIPHENYLAMINE AND DIPHENYL

These chemicals are the active ingredients of the recently introduced smears for screwworms. By cutting down on the losses of livestock caused by this pest, they have saved the farmer millions of dollars.

ETHERS OF ETHYLENE FLUOROHYDRIN

The Germans found the ethers of ethylene fluorohydrin such as β-hydroxyethyl β-fluoroethyl ether, $HOCH_2$ $-CH_2-O-CH_2-CH_2F$, to be non-toxic to plants, but capable of being absorbed either through the leaves or through the roots and transmitted to all parts. These materials are said to render the plant systemically insecticidal for several weeks. These compounds are very toxic to warm-blooded animals, as are the plants so treated, but no work in this country has yet been published on these materials. Of course it has been known for some years that selenium salts could be taken up by the plant and render it systemically insecticidal, but this is the first instance in which synthetic organics have been shown to do the same thing. This leads to speculation on the possibility of finding chemicals that will make the plant as a whole insecticidal, yet not render it unfit for food. The advantages are that the plants could be treated in advance of insect attack and that the close timing of spray schedules followed today would no longer be necessary.

GRAIN FUMIGANTS

New chemicals are replacing the old even in the field of grain fumigation.

Fumigants now in use for this purpose include:

Chemical	Formula	Boiling Point °C.
Carbon disulfide	CS_2	46
Carbon tetrachloride	CCl_4	76
Ethylene dichloride	$Cl\text{-}CH_2\text{-}CH_2\text{-}Cl$	83
Methyl bromide	CH_3Br	4
Ethylene dibromide	$BrCH_2\text{-}CH_2\text{-}Br$	131
Acrylonitrile	$CH_2{=}CH\text{-}CN$	78
Chloropicrin	CCl_3NO_2	112

In addition to the compounds listed above, β-methyl methallyl chloride, 1,1-dichloro-1-nitroethane, and ethyl formate are being used either in limited commercial applications or in large scale trials. Trichloroacetonitrile was recommended by the Germans but is not currently being developed in this country.

Carbon disulfide is highly flammable. Methyl bromide is extremely poisonous and has little warning properties. Chloropicrin is an irritant and lachrymator. One of the recent developments is the use of a mixture containing about ¼ ethylene dibromide or methyl bromide and ¾ ethylene dichloride. This mixture has the advantage of being effective at lower dosage than the straight ethylene dichloride while extending the ethylene dibromide or methyl bromide to make a more economical mixture. Ethylene dibromide and 1,1-dichloro-1-nitroethane are usually recommended in mixtures with carbon tetrachloride.

Over 60% of the grain in this country is held in storage on the farm. The recommended fumigant for this farm-stored grain is a mixture of three parts of ethylene dichloride and one part of carbon tetrachloride since this mixture offers a minimum of toxicity hazard together with non-flammability.

Fumigants will be discussed further under the heading of nematocides and fungicidal fumigants. Mention should be made here of the use of HCN against scale insects on citrus.

REPELLENTS

Materials repellent to insects that attack plants have not come into wide use probably because chemicals that will keep insects away from plants for two weeks or longer are not known. There is a great need for such chemicals particularly in the field of plant viruses. Many plant viruses are carried by insects. To protect against the virus, it is necessary to prevent all the carrier insects from feeding on the plant. It is not sufficient to kill the insects after they have fed nor to hold the feeding damage down to commercial control levels, because the feeding of one viruliferous insect may result in as much virus damage as that of hundreds of viruliferous insects on a given plant.

Considerable progress has been made in keeping blood-sucking flies off animals. This was first done with the alkyl thiocyanates, which killed the flies and by repellent action kept them off the cows, or reduced their numbers for periods up to one day. DDT has been outstandingly successful in keeping insects, particularly horn flies, house flies, and mosquitoes, off cattle for periods up to two weeks. With its use it has been conclusively shown that these insects were keeping cattle from gaining as much as one pound a day and markedly reduced the milk production. There remains a great need for effective repellents for deer flies, stable flies, and horse flies, since DDT is ineffective in keeping these pests under control on animals. Such repellents should last at least two weeks and preferably longer.

Insect repellents are currently finding their greatest use on humans, where they are successfully used against mosquitoes and black flies. Here, the newer synthetic materials have almost entirely replaced the older natural materials. These chemicals are often important to the farmer in protecting his laborers from mosquito populations so severe as to render field work otherwise impossible. In fact, certain repellents commonly sold in two ounce bottles at the drug store have been purchased in 55 gallon drum lots by New Jersey truck farmers. In certain instances these materials have made possible the salvaging of crops that might otherwise have been lost because of the refusal of the laborers to work as a result of the heavy mosquito population. The better known mosquito repellents are: 2-ethylhexanediol, α,α-dimethyl-α-carbutoxy-γ-pyrone, dimethyl phthalate and a mixture of *o*-phenylcyclohexanol and *o*-cyclohexycyclohexanol.

Table I gives some of the prime manufacturers of the newer insecticides which are discussed in the present article. Under the new agricultural insecticide and fungicide act manufacturers are required to list on the label the active ingredients of the materials they offer for sale. It is beyond the scope of this article to list the formulators and their trademarks. Entoma, a publication of the Eastern Branch of the American Association of Economic Entomologists, lists over ninety manufacturers and distributors of DDT. Even this is not claimed to be a complete list. Many of these sell from 5 to 10 or more distinct formulations for different purposes.

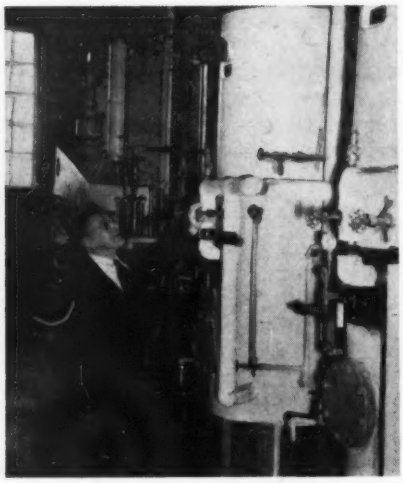
The new chemicals of promise in this field are usually offered by a number of concerns, most of which have their own formulations. These vary principally in content of active ingredient and amount and nature of supplementary ingredients. There is a tendency to offer a limited number of preparations, which are similar in active-ingredient content and which differ principally in nature and amounts of emulsifiers, solvents and diluents. An attempt has been made in the discussion of each insecticide to point out some of the forms in which it is commonly offered to the consumer.

This does not by far exhaust the new chemicals that might be discussed. Ten years ago most of those discussed in this paper were unknown as insecticides; now all are either being sold in substantial quantities or give indication performance-wise that they will be sold in such quantity. This is an impressive advance. Ten years ago there were not more than four synthetic organic insecticides selling in volume. Since then at least a dozen have been introduced and at least half of this number are already selling in larger volume than all of those (excepting ethylene dichloride) known prior to 1938.

Pennsylvania Salt Manufacturing Co.

Southern California orange grove receiving a treatment for the control of orange worms.

Part II of this article, covering fungicides, herbicides, and miscellaneous synthetics used in agriculture, will appear in the August issue.—EDITOR.



George Gardner, research chemist, checks solvent recovery equipment in ACP plant.

CHOLESTEROL Now Made From WOOL GREASE

by HOWARD C. E. JOHNSON, Managing Editor, Chemical Industries

ANIMAL BRAINS AND SPINAL CORDS have provided the main domestic source of commercial cholesterol, important intermediate for synthetic hormones and ingredient of certain cosmetics. American Chemical Paint Co. will make it from wool grease, will eventually double domestic output.

THE YEAR 1932 will go down in history as marking the birth of modern steroid chemistry, for in that year the chemical structure of cholesterol was worked out. After that, all the related pieces of the jig-saw puzzle—bile acids, hormones, and other natural steroids—fell neatly into place.

Cholesterol had long been known—since 1788, in fact—as a constituent of brain and spinal tissue, egg yolk, wool grease, bile, certain fats, and various liver oils. But it wasn't until some twelve dozen years later that the constitution of this important natural substance was unraveled, permitting chemists to learn the relationship to each other of the various steroid substances.

During the last 15 years steroid science and technology have made remarkable strides. Most of the study, obviously, had been in the biochemical field, where workers have sought to learn about steroid metabolism, origin of natural steroid derivatives, and the relationship—if any—between the steroids and the chemically similar cancer-producing agents. Out of these fundamental studies has arisen a new industry: synthesis of hormones and vitamin D_3 from cholesterol.

LOW OUTPUT, HIGH COST

Pure, crystalline vitamin D_3 and hormones are not cheap by any means: estradiol, for example, is currently quoted at $29 per gram. But at that rate, a few hundred pounds a year represents big business.

The medical profession is only beginning to appreciate the potentialities of hormone therapy for aberrations accompanying menstruation, pregnancy, and menopause, and other conditions arising from hormone imbalance. It may reasonably be expected that the demand for these synthetic compounds will materially increase in the future.

Hormones were originally prepared from natural sources, such as urine and slaughterhouse refuse, but it is now cheaper to synthesize them from cholesterol by well worked-out methods. The credibility of that statement is suggested by the fact that the adrenal glands of 20,000 steers provide only 18-60 grams of a cortical hormone mixture, from which less than a gram of any particular hormone can be isolated. The product yields from cholesterol are not high, for the processes require several difficult steps; but the prices commanded by the final products permit a lot of processing.

(Cholesterol, incidentally, is not the only practical raw material for hormone synthesis. Some procedures start with phytosterol from soy beans, and a Mexican concern, Syntex, S. A., produces a series of synthetic hormones from the roots of a sapogenic plant of the *Dioscurea* family native to Mexico. Patents are pending in the U. S. on the Syntex processes.)

A SLAUGHTERHOUSE PRODUCT

Chemically, cholesterol is a rather complicated high-molecular-weight secondary alcohol which currently sells (USP grade) for $12 per lb. It has the usual four-ring steroid (cyclopentanoperhydrophenanthrene) nucleus to which are attached several alkyl groups and a hydroxyl group. Since it is perfectly harmless to the skin—occuring, indeed, in the body tissues—it is widely used in certain cosmetic creams and lotions.

Most commercial cholesterol has been a by-product of slaughterhouse operations. The neural sheaths of the carcasses' spinal cords are removed and solvent-extracted. The oily residue left by evaporation of the solvent is centrifuged, and the crude cholesterol thus obtained is crystallized from alcohol. About 4 lbs. of product is obtained from 100 lbs. of spinal cord "skins."

NOW FROM LANOLIN

The American Chemical Paint Co. is just completing a $400,000, three-story plant at its Ambler, Pa., works to manufacture cholesterol from wool grease, which has been known since 1873 to be the richest source. Difficulty of separation has hindered wide utilization of this material for the preparation of cholesterol, however.

Wool grease, or lanolin, is a complex mixture of cholesterol, lanosterol, and straight-chain alcohol esters of fatty acids. In the ACP process the wool grease is first refined to remove water and dirt. It is then saponified and the fatty-acid soaps are separated from the unsaponifiable fraction. Cholesterol is then isolated from the other unsaponifiables by solvent extraction. The purity of the product is very high, and practically all of it, consequently, will be utilized for pharmaceuticals.

Details of the process are closely guarded by ACP, but some of its salient features may be inferred from the description of a comparable mode of manufacture used in Germany[1]:

"A batch of 100 kg. of unsaponifiable wool-wax is melted with two atmospheres steam and forced by compressed air into 700 l. of methanol at 40° (C.). The mixture is steamed for five minutes and stirred. It is then cooled to 42° and settled. After decanting 600 l. of clear methanol, the

[1] FIAT Final Report No. 996, "The Commercial Development and Manufacture of Synthetic Hormones in Germany."

sludge is boiled up with 400 l. of fresh methanol, cooled to 42°, settled and decanted. The methanol extracts are united, concentrated to 500 cc. (sic), and cooled to 7 to 8°. The crude cholesterol precipitates as a yellow paste. It is centrifuged and dried yielding 40 kg. of dry crude cholesterol.

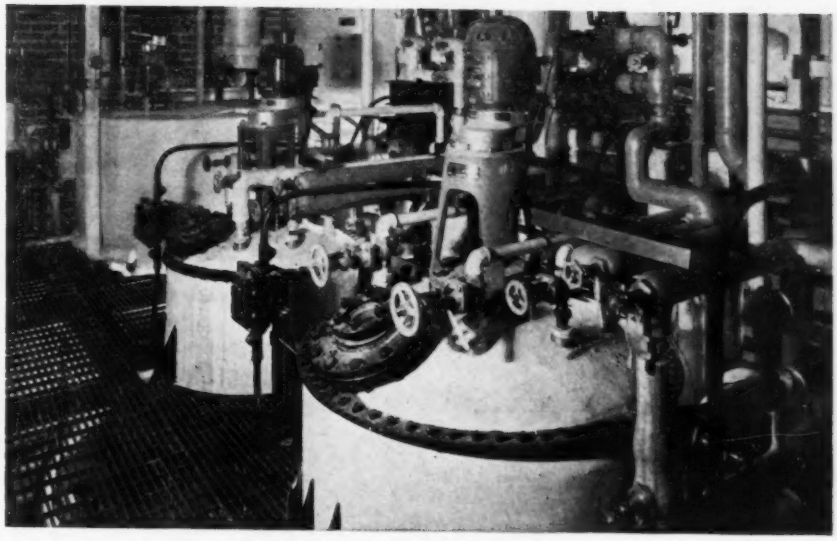
"Four such batches are united, melted by steam heat, and passed through a filter to a crystallizer held at 70° for two to three hours. The cholesterol crystallizes in its own oil and is centrifuged at 60 to 65°. The oils are again crystallized at 50 to 60° and again centrifuged. The united cholesterol crystals amount to 10 kg. Recrystallization of 60 kg. of fatty cholesterol crystals from 300 l. of ethanol containing one per cent of toluene and recrystallization of the 50 kg. of spirit-moist crystals from 400 l. of toluene-ethanol and 500 kg. of animal charcoal yield a cholesterol, m.p. 144-146°. The material is dried and 40 kg. of the solvent-free crystals are boiled up with 400 l. of dilute acetone (1:10). Crystallization yields six to seven kg. of pure cholesterol, m.p. 148-149°, from 100 kg. of woolwax."

HOW ACP GOT INTO IT

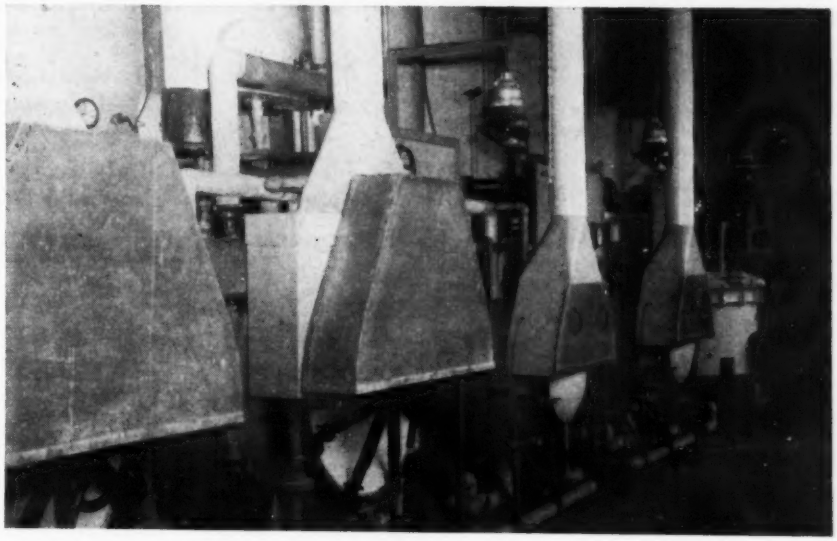
Cholesterol appears to be a strange fish in ACP's pond; but the steps leading up to the present development are logical enough. Several years ago some ACP men looked into the general problem of detergency and tried to reduce it to a scientific basis. (The company still makes such detergent materials as alkali silicates.) They fastened especially on the problem of wool scouring, which until then has been on a wholly empirical basis, and came up with a process which cleaned the wool and recovered over half of the grease. Licensees used the process, and paid ACP royalties in the form of wool grease. Refining of lanolin and manufacture of cholesterol were the two subsequent logical steps to increase the value of the product.

The work necessary to isolate and purify the cholesterol would render the process uneconomic except for automatic control. The plant is so designed that twenty-two men can operate it.

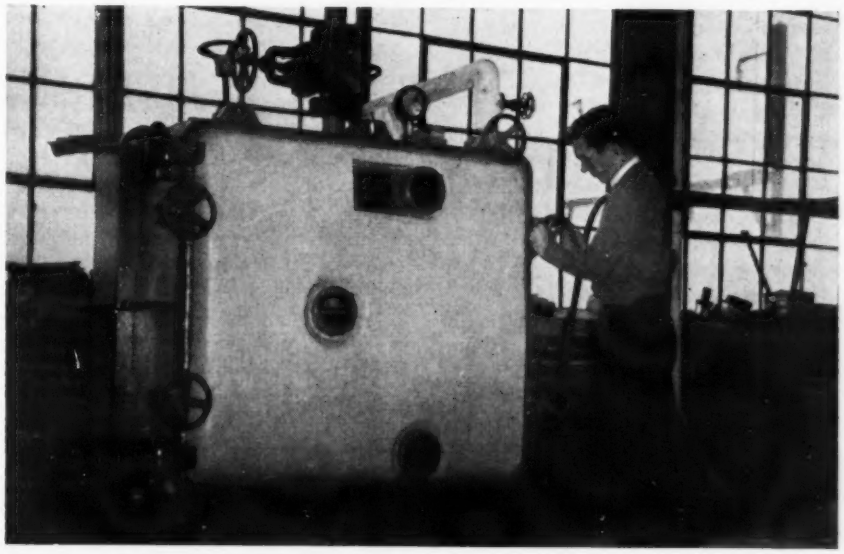
Capacity of the plant is large enough to double, eventually, the current annual U. S. output. What that output is can only be guessed; there are no official figures. But best guesses around the industry put the figure at about 100,000 lbs. ACP is out to cut a slice of that profitable melon, and—as indicated by the growing interest in vitamin and hormone therapy—that melon is likely to get a lot bigger.



Clean wool grease is saponified and the soaps separated from neutral fraction.



Cholesterol is solvent-extracted from other neutral products and crystallized.



Ellsworth Stockbower, research chemist, is about to check dried cholesterol.

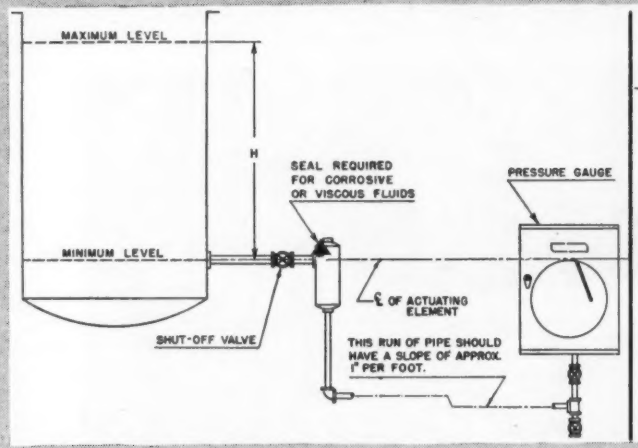

MAXIMUM LEVEL
H
SEAL REQUIRED FOR CORROSIVE OR VISCOUS FLUIDS
PRESSURE GAUGE
MINIMUM LEVEL
℄ OF ACTUATING ELEMENT
SHUT-OFF VALVE
THIS RUN OF PIPE SHOULD HAVE A SLOPE OF APPROX. 1" PER FOOT.

Fig. 1—Pressure gauge connected directly to vessel.

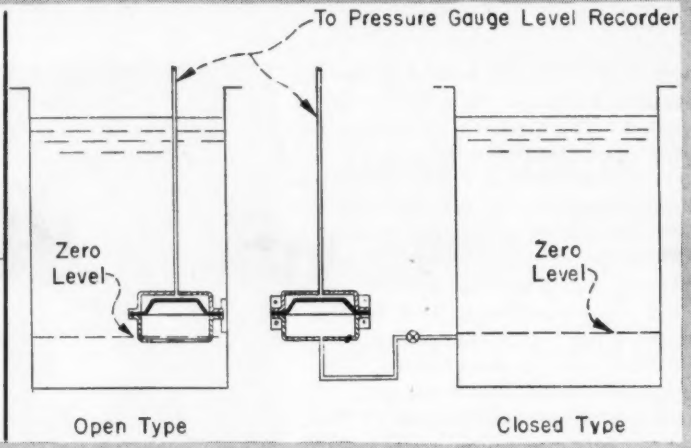


Fig. 2—Open and closed diaphragm box installation.

LIQUID LEVEL MEASUREMENT In Chemical Processing

by S. D. ROSS, The Brown Instrument Co., A Division of Minneapolis-Honeywell Regulator Co., Philadelphia, Penna.

SIMPLE BALL FLOATS will still measure liquid level, but electronic units indicate the widened range of tools the process engineer is bringing to this job.

THE increase in semi-continuous and continuous processing in the chemical industries has raised measurement of liquid level to a position of almost equal prominence with that of temperature, pressure, or flow measurement. Surge vessels, accumulators, tower bottoms, and the like in today's plants are commonly equipped with some means of level detection—usually as the basis for automatic control. Although simple and time-tested devices are still in general use, a necessary outcome of the more important industrial role for liquid level measurement has been the development of unique systems permitting the introduction of processing conditions not heretofore employed. Employment of gamma rays emitted from radium to measure level in hydrogen fluoride storage tanks is an indication of these new tools.

In some cases, simply a non-indicating, high- or low-level alarm is sufficient; in other instances, continuous measurement over a wide range with a gradual correction of the flow from the vessel is mandatory to prevent sudden upstream surges in the process from being transmitted to subsequent stages. The latter cases often require local indication of the level for the operator, as well as remote transmission and recording of the value at a centralized instrument panel.

Instrument selection is influenced by the widely varying functional requirements of level meters to be integrated with the many different operating conditions found in chemical processes. Corrosive chemicals, vessels under pressure, fluids containing suspended solids, highly volatile and inflammable liquids—these are but a few of the factors peculiar to the application that must be considered in the choice of a meter to provide reliable and trouble-free performance.

Some indication of the size of this field is given in the 1948 *Instruments* Index, published annually by *Instruments* magazine, where 110 manufacturers of "indicating liquid level gauges" are listed. In the discussion of commercially available means for level measurement, four categories suggest themselves:

(1) *Head measuring systems*, wherein common pressure-measuring instruments, calibrated in terms of liquid level, are actuated either directly or indirectly by a head of liquid. This is similar to the barometer which is operated by the pressure of the earth's atmosphere.

(2) *Displacement type methods*, which utilize a suitable float as a level detecting means in accordance with Archimedes' principle—a body wholly or partly immersed in a liquid is buoyed up a force equal to the weight of the liquid displaced.

(3) *Electrode or "probe" devices*, wherein the electrical conductivity of the liquid completes an electrical circuit to a relay through an insulated conductor as a means of detecting a predetermined high or low level condition, or both.

(4) *Newer systems*, which employ electronic potentiometers as a detecting means for a suitable primary element. This element provides small voltage or resistance changes in relation to changes in liquid level and may be classified under one of the three previously outlined categories. They have in common only the fact that they utilize an automatically-balanced electronic potentiometer circuit. For example, the Statham gauge, which is described as one of the "newer systems", is essentially a head or differential pressure measuring element and thus could fall in the first class.

HEAD MEASURING SYSTEMS

Any liquid in a vessel exerts a hydrostatic pressure or "head" on a point below the surface directly proportional to (1) the vertical height between the point and the surface and (2) the density of the liquid. For a liquid of known density this provides a method of liquid level measurement. Thus, two widely used industrial in-

struments—the *pressure gauge* and the *differential-pressure type flow meter*—have been adapted for this use and several head measuring systems have recently been specifically designed for liquid level measurement.

PRESSURE GAUGE METHODS

Industrial pressure gauges are available for measurement of pressures as high as 10,000 psi. However, where normally encountered pressures of less than 10 psi, such as exerted by a 20 foot head of water, are concerned, only the lower range types are required. The pressure measuring element located in the instrument case, is connected to the pressure source by means of a small diameter (approx. ¼") tubing, actuating an indicating pointer or recording pen through mechanical linkage.

Three elements commonly utilized for level measurement are tabulated below with the full scale range limits of each. The accuracy of each is within ± 1% of full scale.

Pressure Element	Ranges
Spiral	0-10 psi to 0-4000 psi gauge
Spring-Opposed Metallic Bellows (Intermediate Range)	0-100" water to 0-15 psi gauge
Larger Diameter Spring-Opposed Metallic Bellows (Low Range)	0.5" to 0-75" water

In application, the pressure gauge is usually employed in one of three different ways, depending upon the fluid being measured: (1) directly connected, (2) with diaphragm seal, and (3) with air or gas purge. These types can be used for measurements in open vessels. They do not compensate for varying vessel pressure and cannot be used on vessels under pressure.

Directly-connected. For liquids which can come into direct contact with the pressure element (bronze is standard) and which do not contain materials that will clog the pressure tubing, the pressure gauge is usually connected directly to the pressure tap at the point of minimum level (Fig. 1). If the center line of the gauge is not at the same elevation as the pressure tap, a zero screw adjustment in the instrument compensates for the head effect in the gauge lines.

Diaphragm-Seal. A flexible rubber or neoprene diaphragm enclosed in a metal housing can be used (Fig. 2) to seal the pressure element from the fluid. One side of the diaphragm is subjected to the pressure of the head of liquid forcing the diaphragm upward and compressing the air enclosed in the upper portion of the box and in the gauge line. The gauge measures the resultant air pressure but is calibrated in terms of liquid level. An open type box, immersed directly in the vessel liquid, can be used where some suspended or solid-forming materials are involved. A closed type box is used only with clear liquids. Because of the errors introduced, tubing lengths between box and gauge should not be more than about 50 feet. The maximum temperature of fluids measured should be less than 150 F since continual contact of the diaphragm with hot fluids results in accelerated deterioration of the diaphragm.

A recent advance in this type of system for certain applications utilizes a metallic diaphragm seal[1]. A three-inch flexible stainless steel diaphragm is mounted on a standard flange with a non-indicating pneumatic transmitter unit as an integral part of the assembly. With the flange installed over an opening in the vessel at the minimum level, the transmitter converts hydrostatic heads into air pressures which are connected by tubing to a pneumatic indicator or recorder. A similar type[1] amplifies or reduces the pneumatic pressure, for example, where the hydrostatic head is low or where the air supply to the transmitter is less than the hydrostatic pressure to be measured.

Air or Gas Purge: The air or gas purge system (Fig. 3) finds increasing application in modern chemical plants. It does not limit the location of the gauge and permits level measurement of liquids containing relatively large amounts of suspended matter or solutions which will precipitate solids upon cooling. In operation, a small diameter (approx. ¼") tube is immersed in the liquid at the minimum level. The pressure and supply of air or gas purge passing through the tube is controlled by a regulator to allow slow bubbling from the tube when the vessel is filled.

(A small differential pressure regulator installed across a C-clamp rotameter is recommended to provide the accurate control of air flow required in this system, usually about two or three cubic feet of free air or gas per hour.

The construction and functioning of this unit is much the same as that employed in the "Variable Displacement Level Meter" considered later in this article.)

The pressure in the line is then equal to the back pressure exerted by the head of liquid; measurement of this line pressure serves as a basis for level measurement. Where immersion of the line in the vessel is not desirable because of agitator blades or other obstructions, the line can be tapped into the side of the vessel at minimum level.

DIFFERENTIAL PRESSURE MANOMETERS

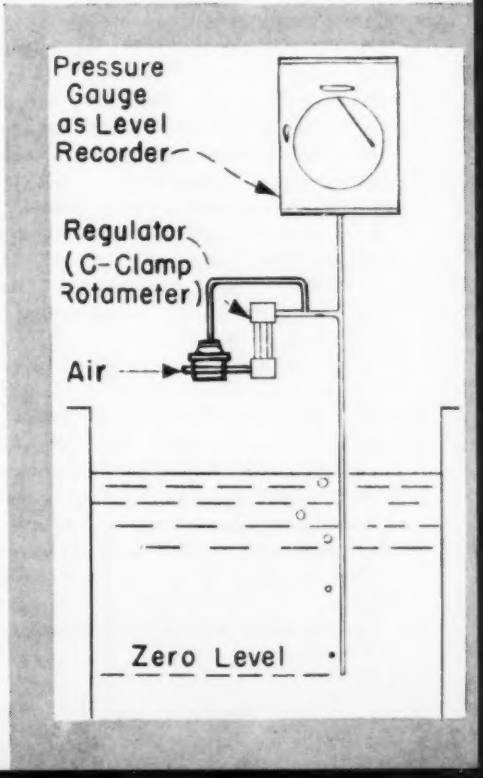
The U-tube mercury manometer commonly used with an orifice in pipe lines to measure process flow rates by measurement of the differential pressure across the orifice is also widely employed for liquid level measurement. It is available in two basic types: (1) the *mechanical*, wherein the mercury float is mechanically linked to the pen or pointer; and (2) the *electrical*, wherein an armature rod of an inductance bridge system is attached to the mercury float and positions a second rod electrically in the indicating or recording instrument. In the mechanical type, the meter body (manometer) is attached on the back of the instrument case; in the electric type, the meter body is a separate unit which can be remote from the instrument, if desired.

Recently, *mercuryless* differential pressure type flow meters have been marketed, particularly for applications where the presence of mercury is unsuitable. In these units, the differential pressure is converted by a metallic bellows into a linear force balanced by a torque tube. It is thereby converted directly into mechanical movement of a pen or pointer or into a corresponding air pressure for remote transmission. In general such instruments can also be applied for level measurement, as described below for mercury manometers installed in open and closed vessels.

Level measurement by flow meter manometers offers the following notable advantages:

(1) availability for ranges from 20" to 25' water and for working pressures up to 5,000 psi.

Fig. 3—Air or gas purge system.



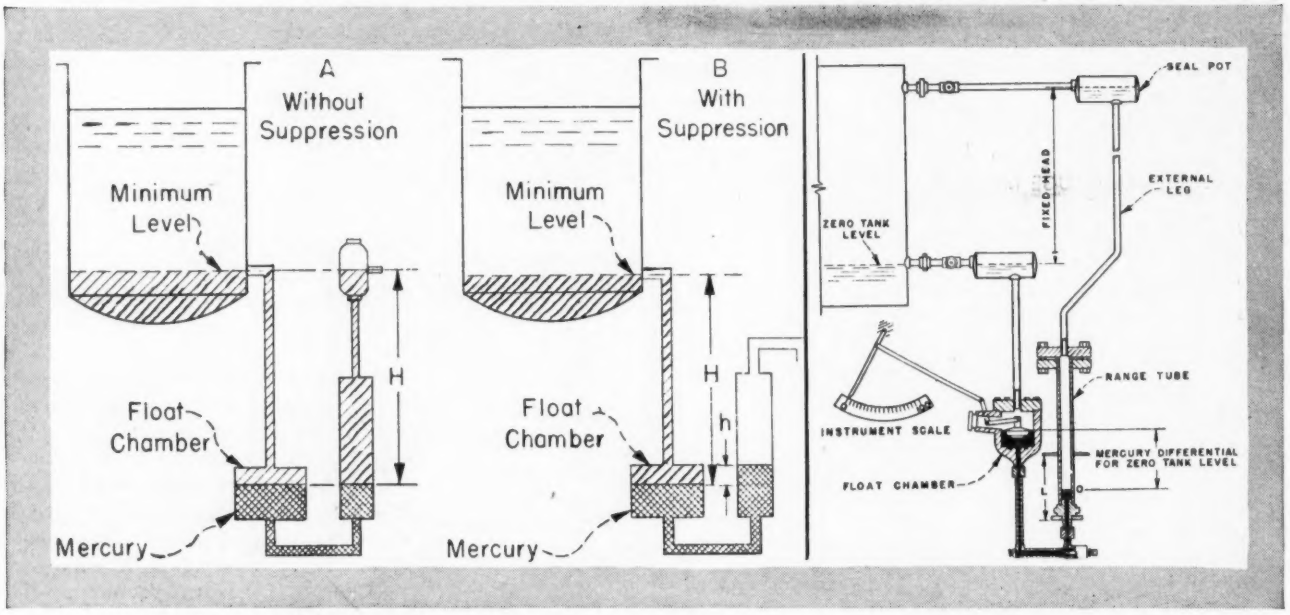


Fig. 4—Schematic diagrams of electrical or mechanical mercury manometers installed for measurement of level in open vessels.

Fig. 5—Mechanical meter body with "dropped" range tube for closed vessels.

(2) greater accuracy than pressure gauges particularly where head effect of an elevated tank on a floor level gauge is involved.

(3) simplification of parts stocking and maintenance where same make of flow metering instruments is utilized in a given chemical plant.

Open Vessels: The minimum level tap is connected to the high pressure (float chamber) side of the meter body, with the range tube side to atmosphere, as illustrated in the two schematic diagrams (Fig. 4) for systems "without suppression" (*A*) and "with suppression" (*B*). System (*A*) has a reservoir and connecting line to the range tube which contains the vessel liquid with a head (*H*) equal to that on the float chamber, permitting the float to rise to its zero position for minimum level.

System *B* has no reservoir, depending upon additional mercury (*h* on diagram *B*) in the range tube side to "suppress" (counteract) the head of liquid in the float chamber and connecting line. Installation of extra piping which is particularly objectionable when the instrument is mounted considerably below the vessel, or where there is a possibility of the liquid freezing in the outside leg, is eliminated in this system.

Vessels Under Pressure: The pressure existing above the liquid in a closed vessel is, of course, additive to the hydrostatic head and requires compensation. The ideal instrument for this purpose is the flow meter manometer, because it can be installed to measure a differential pressure which changes only as the level varies.

As shown in Fig. 5, the mechanical meter body is installed with the range tube side connected near the top of the vessel, and the float chamber, near the bottom. A fixed pressure equal to the pressure in the vessel plus the constant liquid head in the vertical connecting line is thus exerted on the range tube side. A variable pressure, equal to the vessel pressure plus the hydrostatic head in the vessel, is impressed on the float chamber side. The pressure in the vessel, acting upon both sides of the meter body, cancels out.

Because the *differential* pressure exerted on the range tube side is a maximum at minimum level—the reverse of normal conditions for manometer readings in flow measurement—use is made of what is termed a "dropped" range tube meter. This permits the instrument pen or pointer to assume its normal zero position and to travel toward its full scale position as the level increases. With the electrical meter, however, the float chamber side of the meter body is connected to the top of the closed vessel. Reversal of the instrument response is achieved by switching the two outside electrical connections to the recorder or indicator.

An air or gas purge, similar to that described previously for the system utilizing a pressure gauge, can also be employed with mercury manometers. Inasmuch as the meter body and connecting piping are filled with the purge gas, which has negligible density, the only head effect impressed on the meter is that of the liquid in the vessel. In this system, therefore, the minimum level connection is made to the float chamber side of the meter body whether it is of the electrical or mechanical type. In the case of the latter, the dropped range tube construction is not required.

REMOTE TRANSMISSION OF MEASUREMENTS

Both the pressure gauge and mechanical meter can be furnished in indicating styles with a pneumatic transmission system whereby the level measurement can be remotely recorded and controlled at a centralized panel board some 1,000 feet distant. The use of matched transmitting and receiving bellows in such systems provides a high degree of accuracy in the transmitted measurement. As many as three pneumatic level transmitters can be connected to one three-pen pneumatic receiver recorder for conservation of panel space.

The electrical manometer with its inductance bridge principle inherently permits transmission of the level measurement to a remote recorder or recording controller. If an indication of the level at the process is also desired, a second indicating inductance bridge instrument can be wired in parallel with the recorder.

Both the pressure gauges and manometers can be equipped with all the common modes of pneumatic control, including two-position, proportional, and proportional plus reset or rate action. Pressure gauges have recently been offered with a vane type electronic control unit to provide fast-acting switch operation at the level set point.

DISPLACEMENT TYPE METHODS

Two types of level measuring devices which depend upon the buoyant effect of the liquid are available. These primarily used for control are:

the *ball float* and the *variable displacement* types. The first is probably the oldest and simplest means but still finds wide application. However, the range of level change it can accommodate is limited. The second type was developed to overcome the range limitation of the first and is more commonly employed today. Both types may be used in either open or closed tanks.

BALL FLOAT TYPE

This is a constant "displacement" type, wherein a spherical float on the end of a pivoted arm displaces its own weight of fluid and floats on the liquid surface. The most familiar example of this type is the high level cutoff installed in millions of bathroom toilets. In a modified form, this same principle is found in the simple, externally mounted boiler low water cutoff, which has top and bottom pipe connections to the boiler as does the ordinary gauge glass. A glass enclosed mercury switch on the exterior end of the pivot arm is tilted to open or close an electric control circuit when the level reaches a low limit.

Non-indicating ball float controllers with mercury switches are also available. In these, the position of the float affects a magnetic field which actuates a switch. Since direct mechanical linkage is eliminated, the unit requires no stuffing box with attendant possibilities of leakage. Moreover, no foreign substances come in contact with the liquid. Thus, its use is suggested for applications where sterile conditions are necessary.

Ball float level controllers are also supplied with small non-indicating pneumatic control mechanisms. These can provide proportional and proportional-reset control, or pneumatic transmission of the measurement for remote indication or recording of the level. Their primary drawback is that the float travel is short—from 6-8″ to 3-6′ maximum. This limits their use to processes which do not have abrupt or rapid changes in the regulated inlet or outlet flow. Moreover, the ball float method can not be used with any liquid which alters the buoyancy of the float by collection of solid matter on it or by corrosion.

A ball float attached to a vertical cable which is mechanically connected by pulleys to an indicating dial mechanism is available for local indication of level over a wide range, as may be desired in a storage tank. Recently, such arrangements have been supplied with a selsyn system of electrical motion transmission to provide remote indication of the level. An electronic recorder has been used with one such selsyn transmitter unit, for example, to measure the level of molten glass. In this system, an electrode is periodically motor-driven up and down to sense the level, energizing an electrical circuit upon contact with the glass. This causes recording of level in accordance with the signal from the selsyn motor which rotates with respect to the electrode position.

VARIABLE DISPLACEMENT TYPE

The "displacement type" uses a long cylindrical float heavy enough just to sink in the densest liquid whose level is to be measured. A pivot arm attached to the float is rigidly affixed to a thin-walled *torque tube*. The torque tube is essentially a torsion spring twisted by the weight of the unsupported float (at zero level) until it creates an equal opposing force. As liquid rises in the chamber around the float, the latter is partially buoyed up by a force equal to the weight of the liquid it displaces. This force results in a slight upward movement of the float and a corresponding decrease in the twist of the torque tube.

Such an arrangement is utilized for level measurement and control by conversion of motion to air pressure. A rotary shaft, actuated in accordance with the untwisting of the torque tube, causes movement of a flapper in an air pilot system which can provide both pneumatic control and remote level transmission. These instruments are available in the form shown, as well as in styles designed for mounting on top or side of tank. Ranges are from 14″ to 15′ of level. The displacement type offers a wider range than the ball float instrument, and requires no stuffing box to seal the vessel liquid from the measuring unit. It is particularly well adapted to interface level measurement between two immiscible liquids for differences in specific gravities as slight as 0.1.

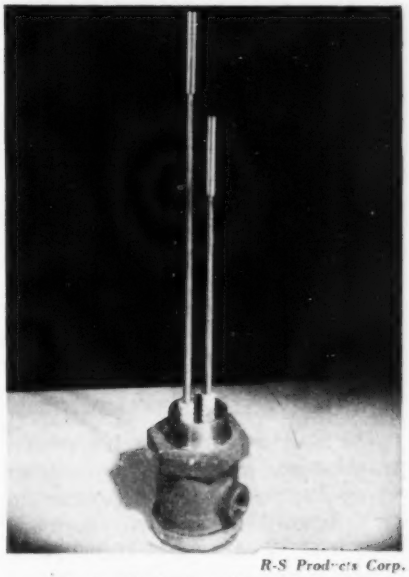
Most displacement type level meters are sensitive to specific gravity variations and are equipped with a calibrated scale which can be set for any specific gravity within the range of the instrument.

ELECTRODE OR PROBE SYSTEMS

If liquid level is to be controlled at one specific point, or between set limits, and no indication or record of the variation is required, simple and inexpensive electrode or "probe" systems are often suitable. These depend on the electrical conductivity of the vessel liquid and utilize sensitive electric or electronic relays to close alarm or control contacts.

ELECTRIC TYPE

The electric type employs an electric-pneumatic relay operated from a sensitive *electric* relay to open or close an air-operated diaphragm valve on an inlet line. It is used in the textile industry on the size box for coating size solution on cloth. Low voltage current flows between the tank wall and the electrodes when they are covered by the liquid. When the level drops below the lower electrode, the circuit to one coil in the relay is interrupted causing the control valve to open until the level rises to the upper electrode. This energizes a second relay coil causing the valve to close again.



R-S Products Corp.

Fig. 6—Typical vertical probe available for electronic level control.

Two electrodes are used relatively close together to prevent erratic control caused by turbulence of the solution. However, they can be placed any vertical distance apart in other operations for high-low control of level in a tank. Where the liquid surface is relatively calm, one electrode can be used for high or low limit service.

Such a system can be used with most aqueous solutions of electrolytes or with other fluids having resistivities less than 20,000 ohm-cm. which will not be ignited by arcing. A limited degree of adjustment for the level control point is provided by "L" shaped rods on the end of the electrodes which can be raised or lowered.

ELECTRONIC TYPE

With liquids of low electrical conductivity, *electronic* relay offers the increased sensitivity necessary for utilization of the probe system. Such devices are available for operation at resistivities up to 20,000,000 ohm-cm. (20 megohm-cm.) with a knob adjustment for selection of the most suitable relay sensitivity. Even dis-

tilled water or alcohol has sufficient conductivity to operate such relays. The small amount of wattage required for relay operation makes it unlikely that sparking at the probe could cause ignition of vapors.

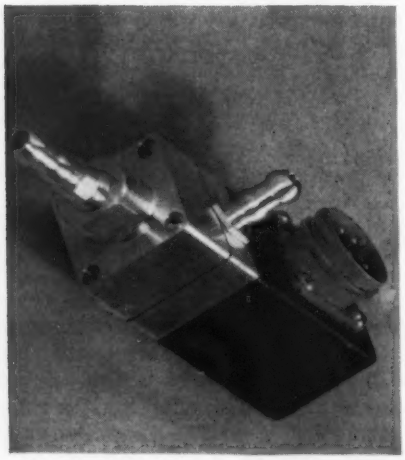
Figure 6 illustrates a common type of vertical double-probe assembly available for one design of electronic level control. The terminal connections are protected by a weatherproof head so that moisture will not cause a short circuit. Both electric and electronic probe systems can also be used for interface level control where one liquid is a conductor and the other is not.

NEWER SYSTEMS

Ingenious systems have recently employed electronic circuits for continuous recording and controlling of liquid levels. Utilizing a conventional potentiometer, such systems, although at present relatively expensive, offer means to meet unusual measurement problems and give promise of increased application in the future.

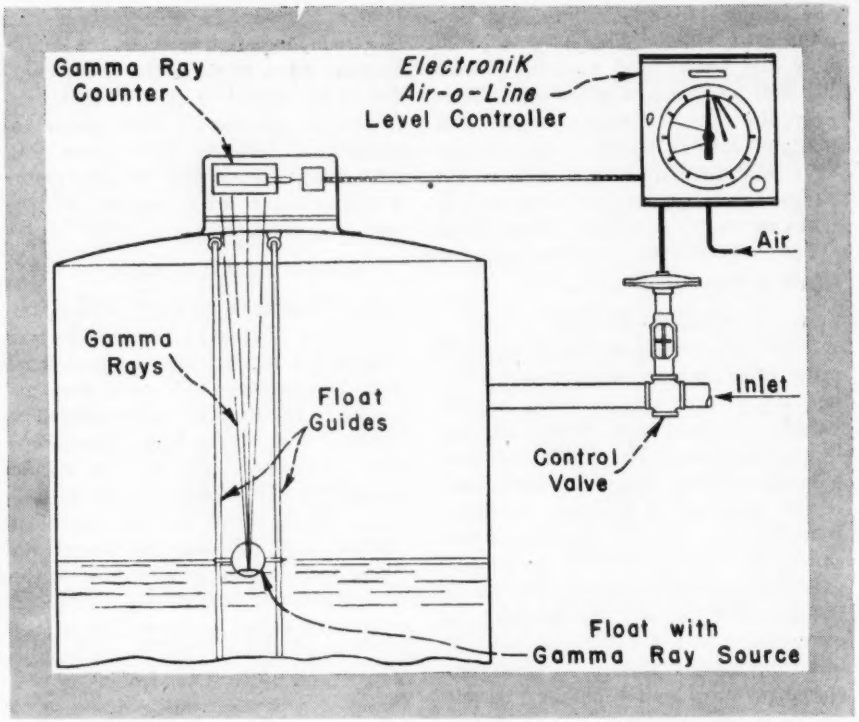
STATHAM PRESSURE TRANSMITTERS

The Statham pressure transmitter provides an accurate and sensitive means for the measurement of gauge or differential pressures in ranges from 0 to 0.2 psi to 0 to 10,000 psi in terms of electrical resistance changes in a Wheatstone bridge circuit. The measured pressure acts on a bellows which transmits the resultant force through a connecting rod to a movable "armature." Stressed wires attached to a stationary "frame" and to the armature, change their electrical resistance when elongated or contracted by the force applied to the armature. By the connection of an accurate and sensitive potentiometer to the bridge circuit of these wires, current flow dependent on the resistances is related to the force applied the gauge.



Statham Laboratories, Inc.

Fig. 7—Statham Model P6 pressure transmitter for ranges 0-1 psi to 0-40 psi.



Engineering Laboratories, Inc.

Fig. 8—Schematic diagram of Gagetron system to record and control level.

For liquid level measurement, the Statham transmitter can measure hydrostatic head in the same manner as the common pressure gauge. Where differential pressures are involved, the transmitter is constructed so that different pressures can be applied to each side of the bellows. The gauge may be employed as previously outlined for the U-tube mercury manometer.

In application, the elements of the Statham transmitter, including the bellows unit and assembly of stressed wires, are contained in a rugged housing (Fig. 7) with provision for electric cable and pressure connections. All models are accurate within 1% and are quite stable in calibration. With the narrow ranges available, this type offers a very reliable measuring means.

An outstanding feature of Statham transmitters is the compact, centralized records of level conditions which can be obtained from widely scattered plant locations.

GAMMA RAY SYSTEM

A radically new device, the *Gagetron*, (Fig. 8,) has been used successfully for several difficult measurements in a Tulsa refinery[8]. It utilizes the tremendous penetrating power of gamma rays from a minute particle of radium to measure liquid levels. No connections from the inside of the vessel to the outside are required. It is of particular value when used to measure the level of such highly corrosive liquids as hydrofluoric acid, simplifying the already difficult problem of holding the liquid in its container.

In one method of applying the *Gagetron*, a float with a gamma ray source (an iridium-platinum needle containing a minute quantity of commercially available radium salt) rides between guides directly under a gamma ray detector, a Geiger-Muller counter. The amount of gamma radiation detected bears a definite relationship to the distance between the source and the detector which accordingly generates minute electrical impulses that are translated by the circuit into level measurements.

In another type of installation, the radium source is permanently mounted on a bracket within the vessel at a point where the level is to be maintained. The detector is located on the outside of the vessel at the same height. Any rise in the level over the radium source reduces the penetration of rays, thus initiating control to decrease the level. On a sludge depropanizer unit, the gamma rays penetrated 4" firebrick, ¼" lead, and three steel plates ⅜", ¾", and 1" thick to reach the detector unit.

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CONTINUOUS NITRATION—The Biazzi Process

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EUROPE'S MOST SUCCESSFUL CONTINUOUS NITRATION PROCESS claims increased safety over batch processes commonly used in the U. S.—features intense agitation, rapid reaction, low reactor holdup.

DESPITE the industrial importance of nitration in the manufacture of explosives, dyes, and pharmaceuticals, comparatively little effort has been made in this country to develop continuous processes. Except for the nitroparaffins, substantially all the nitro-derivatives produced in the United States are made batchwise. Some laboratory studies have been made of reaction rates in the nitration of benzene and toulene [3,6], and several continuous processes have been described in the literature. [1,5,7] Until very recently, however, no commercial applications of these results have been made. A few small continuous nitration plants are operating in the United States at present, but information regarding them is not available.

CONTINUOUS IN EUROPE

In Europe, on the other hand, continuous nitration has been practiced commercially for many years. The Schmid-Meissner process for nitroglycerine (NG) was developed at Krummel about 1925. In some plants it was later modified to include superior features of the Biazzi process, and other continuous processes were developed for the manufacture of diethylene glycol dinitrate (DEGN), cyclonite, and other nitro-derivatives. Technical investigators found that in Germany most of the explosives used during the last war were made by continuous nitration, and that continuous processes were much preferred over batch methods.[2]

In the Schmid-Meissner process glycerine and mixed acid are continuously reacted in a fairly large agitated vessel. The NG is separated from the spent acid in inclined baffled tanks, and washed and neutralized in tower-type washers.[8]

The Biazzi process was devised in 1935 by Dr. M. Biazzi of Vevey, Switzerland. Like the Schmid process, it was originally limited to the manufacture of NG. The first plant using this process was built in April, 1936, at Spilamberto, Italy, for a production of 250 lb. of NG per hour. In the following years the process was successfully adapted to a considerable number of nitro-derivatives, as indicated in Table I. Full-scale units have been installed in Germany, Switzerland, Belgium, and Italy among others. Capacities range from 250 to 2,500 lb. per hour of nitrobody. Although this process represents what is probably the most advanced European practice in the field of technical nitration, no detailed information concerning it has hitherto been published.

The chemical reactions and processing steps in the Biazzi process are essentially the same as in the usual batch processes. The raw materials are continuously reacted in a small well-agitated nitrator, then are rapidly separated in an ingenious continuous separator. The nitrobody is continuously washed and stabilized in small agitated tanks.

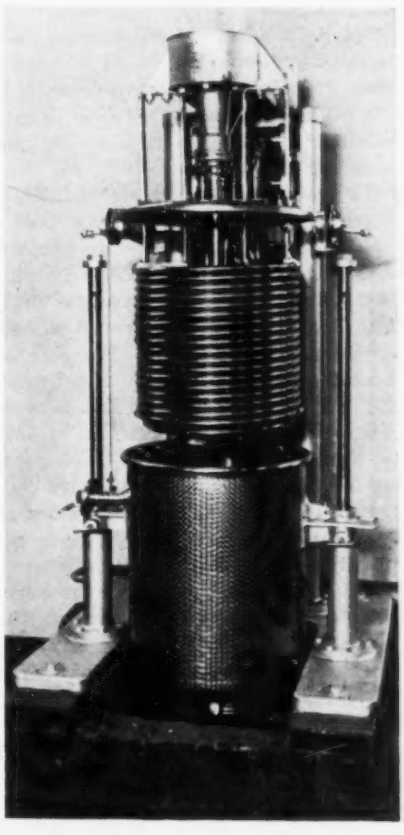
In batch nitrations one reactant, either acid or organic material, is slowly added from a scale tank to a charge of the other reactant. Batch nitrators are large steel, cast iron, or stainless steel vessels, 500 to 3,000 gallons in size, provided with multiple cooling coils and good agitation. The time required to nitrate a batch depends almost entirely on the rate at which heat can be removed from the reacting mixture, since the temperature must be kept low for safety reasons. Typical conditions are: for NG, temperature, below 15°C., nitration time, 60 to 90 minutes; for mononitro benzene, temperature, 50-60°C., time, 2½ hours, followed by "cooking" for 2 hours at 50-60°C. [3,9]

After nitration the nitrobody is separated from the spent acid in a large tank. The separation may take as much as 12 hours. The nitrobody layer is then washed with water and dilute alkali in large brick-, lead-, or stainless steel-lined tubs, often provided with air agitation. The spent acid is usually recovered by denitration.

In the Biazzi process all these steps are continuous and automatically controlled. The equipment throughout is very much smaller than the corresponding batch equipment, and a complete plant can be housed in a very small building. The amount of explosive material present in the whole system at any moment is very small, a significant advantage in explosives manufacture. The exact conditions in each processing step are somewhat different from those in the batch processes, and are said to result in purer products, higher yields, and more economical operation.

NITRATOR

The Biazzi continuous nitrator is a small cylindrical stainless steel vessel, containing a helical cooling coil. A high-speed internal agitator swirls the reacting mixture counter to the flow of cooling liquid in the coil. Feeds enter directly from the main storage tanks, instead of from intermediate



This Biazzi continuous nitrator yields 1,300 pounds of nitroglycerine per hour.

Biazzi unit for continuous production of dinitro orthocresol in the assembly shop.

scale tanks; they flow at carefuly controlled rates into the nitrator through the cover. The two streams meet in a highly agitated zone just above the agitator. Nitrobody and spent acid are continuously withdrawn from the side of the vessel near the top, and flow to a continuous separator.

The intense agitation produces a finely dispersed emulsion of acid and organic compound, and greatly increases the rate of reaction. It has been shown that up to a point, at least, the nitration rate depends primarily on the degree of agitation.[6] As a result, the productive capacity per unit volume is extremely high. More than 1,000 lb. per hour of NG can be made in a 10-gallon nitrator. The holdup time in the nitrator is correspondingly low: 3 to 4 minutes for NG, 4 to 5 minutes for DEGN, and 6 to 12 minutes for nitrobenzene.

In such small vessels relatively much more cooling surface can be provided than in large batch reactors. A 2-gallon continuous nitrator contains about 10 sq. ft. of heat transfer area, 5 to 10 times as much per unit volume as in a batch nitrator. The rate of heat transfer is high, 140 Btu/hr./sq. ft./°F. for the less favorable case of NG. Thus warmer brine or cooling water can be used than in batch processes. Furthermore, the positive control of the reaction permits the use of higher temperatures and stronger nitrating acids than are usually used, without danger of oxidation or overnitration. This further increases the reaction rate, and decreases the loss of nitrobody through solubility in the spent acid. The nitration temperature for NG is between 14° and 20°C. Typical mixed acid analyses are as follows: for NG, 53.5% HNO_3, 48.5% H_2SO_4; for mononitro benzene or mononitro toluene 48.0% HNO_3, 46.0% H_2SO_4, and 6.0% H_2O.

The cooling coil, inlet pipes, agitator, and the loose-fitting cover are mounted as a unit separate from the shell, which can be lowered hydraulically to permit inspection of the coil. At the bottom of the nitrator is an outlet for a drawing line, through which the nitration mass is drained if the temperature rises too high.

The number of nitrators used depends on the product. One nitrator is usually used for mononitrations; for more highly nitrated products several units are used in series. Sometimes the nitration is counter-current, with the spent acid from the dinitration step used as mixed acid for mononitration.

SEPARATION

The continuous separators are squat stainless steel tanks, 20 to 100 gallons in size. The feed enters tangentially through the side at the layer of emulsion between the separated layers of acid and nitrobody. This emulsion layer is thus slowly rotated with reference to both the other layers; the rotation is said to agglomerate the tiny droplets, and rapidly break the emulsion.

A U. S. patent No. 2,438,244 covering this principle has been issued. It is claimed to reduce appreciably the time required for separation, even of the fairly stable emulsion produced by the intense agitation in the nitrator. For NG the separation time is about 10 minutes, less than one-third that required for a standing emulsion. The swirling motion is also said to prevent local overheating resulting from "after-nitration" in the separator, and to eliminate dead spots where explosive nitrobody can collect.

WASHING AND STABILIZATION

The stainless steel wash tanks are about the same in size and external appearance as the nitrators, and are provided with high-speed mechanical agitation. Air agitation is not used. Several washers are used in series, with the wash water flowing counter-current to the nitrobody. Washing is said to be effective and rapid; NG is washed in 10 minutes, appreciably less than the time required in batch processes. Stabilizing liquids are added continuously to the washers in NG manufacture.

Spent acid from the glycerine nitrator flows through a continuous dilutor, where 2% water is added. This dissolves traces of suspended NG, so that the acid can be denitrated safely. The spent acid from DEGN manufacture is also continuously stabilized.

YIELDS AND PRODUCT QUALITY

The consumption of raw materials per 100 lb. of nitrobody is given in Table II. The reported yields for the continuous process are all about 1% higher than published values for batch processes, as shown by Table III; however, this may result from differences in the purity of the raw materials. The continuous process shows some advantage in acid consumption, particularly in nitrobenzene manufacture; the figures for NG are not corrected for recovery of HNO_3 from spent acid in either process, so that the difference between them may not be significant. Recovery of NG from spent acid is not a part of the Biazzi process, and the indicated yield does not include any such recovery.

The products from the continuous process are very pure, especially with regard to overnitrated material. Product analyses are given in Table IV. For comparison, mononitro toluene made batchwise usually contains 2 to 3% of unnitrated material, and about 1% dinitro toluene. However, the amount of unnitrated product depends on the purity of the hydrocarbon;

Table I—Nitrobodies Which Have Been Made by the Biazzi Process

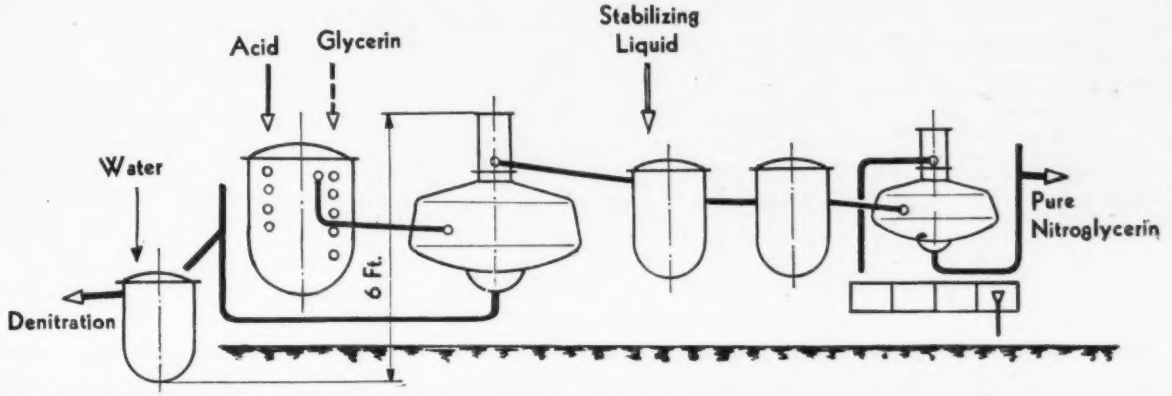
Nitroglycerine (NG)
Monoethylene glycol nitrate (MEGN)
Diethylene glycol dinitrate (DEGN)
Pentaerythritol tetranitrate (PETN)
Cyclonite (Hexogen)
Mononitrobenzene
Mononitrotoluene
Dinitrotoluene
Trinitrotoluene
Mononitronaphthalene
Dinitro ortho cresol
Mononitrochlorbenzene
Dinitrochlorbenzene

Table II—Consumption of Raw Materials Per 100 Lb. of Nitrobody

Product	Organic Comp'd	HNO_3	H_2SO_4
NG—Biazzi	42.4	94	104
—Batch[8]	43.0	100	100
DEGN	57	110	57
PETN	44	200	—
Cyclonite	86	360	—
Nitrobenzene—Biazzi	64.5	52	50
—Batch[9]	65.5	53	72

Biazzi Continuous Nitration Plant

For 2500 lbs. per hour Nitroglycerin or Monoethylene Glycol Nitrate



most toluene nitrated in this country contains 1 or 2% of unnitratable material.

Nitroglycerine made by the Biazzi process is said to have extreme stability. Its Na_2CO_3 content is 0.0003 to 0.0004%; the Abel test gives 22 to 26 minutes at 82°C. with KI-starch test paper.

The spent acid from NG manufacture contains 8 to 10% HNO_3, and about 75% H_2SO_4; from the mononitro benzene or mononitro toluene process, about 1% HNO_3 and 72% H_2SO_4.

GENERAL

All of the pieces of equipment are small, and stainless steel construction is used throughout. The units are mounted in line on a single panel, as shown by the photograph of equipment for dinitro ortho cresol. The agitated vessels have individual drives, with the motors in a separate room back of the panel. Liquids are transferred by suction from one vessel to the next, so that no pumps are required. The result is a very compact plant, perhaps too compact to conform to American standards for easy maintenance. Certainly astonishingly little space is required; a unit for 2,500 lb. per hour of NG is housed in a building 12 feet high with a floor area of 500 sq. ft., the equipment itself occupying only 90 sq. ft.

Table III—Yields of Nitrobody

Product	Yield—% Biazzi Process	Batch Process[a]
Nitroglycerine	95.5	94.3*
Nitrobenzene	98.4	97.0
Nitronaphthalene	95.7	95.0

*Best American practice gives a yield of about 96%.

Table IV—Product Analyses

Product	Unreacted Material %	Dinitro %
Nitrobenzene	<0.5	<0.01
Nitrotoluene	<0.5	<0.01
Nitronaphthalene*	<0.5	<0.1

*96.5% α-nitronaphthalene; 2.2% β-nitronaphthalene; 0.5% nitronaphthol; 0.3% resins.

A major advantage claimed for the Biazzi process is that hazards are minimized. As mentioned before, the amount of explosive in the system at any time is very small. In making 1,000 lb. per hour of NG, only 30 to 40 lb. of separated explosive oil plus that stored for testing is present at any one moment. Safety signals are used on the nitrator, a green light indicating too low a temperature, a red light too high a temperature. If the current fails or the drive belt breaks, both feed streams are automatically shut off. In NG manufacture the feed of glycerine is stopped if the temperature rises above a set limit; if it rises to a second limit the nitration mass is quickly drowned. Similar safety devices are used on the acid-nitrobody separators. It is claimed that no accident has ever occurred in any unit installed to date.

The Biazzi process is said to be more economical than batch processes. Data for a detailed comparison are not available, but probably the claim is justified, especially with regard to investment and fixed charges. Equipment for a complete cointinuous plant for 2,000 lb. per hour of NG costs about $150,000, somewhat below the cost of batch equipment of the same capacity. The building and safety area are much smaller than required for a batch plant.

Operating costs may be somewhat lower than for batch processes, since the consumption of raw materials is slightly smaller, less power is required, and one man can operate a complete line for 2,500 lb. per hour of nitrobody. A small saving results from heating the wash water by the heat of reaction. The economic advantages resulting from these are relatively small. However since stainless steel is used exclusively, maintenance costs should be significantly lower than in batch plants. A unit built in 1938 is still operating with all of its original parts.

To date twelve European companies have acquired the license to use the Biazzi process, or have bought the ready-made equipment. Complete plants are built by Dr. Biazzi in Switzerland, and are supplied in working order with full guarantee as to performance. Several units are currently under construction.

ACKNOWLEDGMENT

The author would like to express his appreciation to Dr. Biazzi for his generous cooperation in supplying data for this article.

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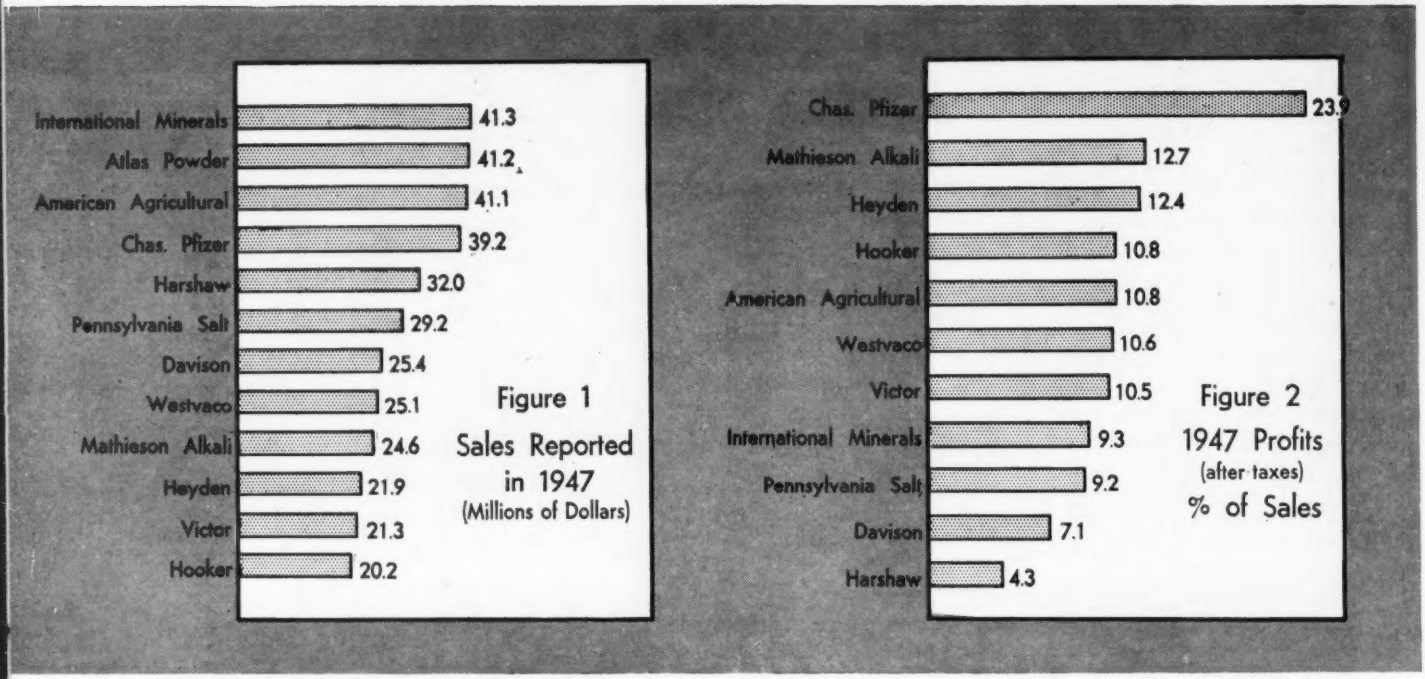


1947 Chemical Company Developments as Reported to the Stockholders

*by P. A. SINGLETON and J. A. SPRAGUE**

PART II: MEDIUM SIZE COMPANIES AND GENERAL PATTERNS

LAST YEAR WAS AN IMPORTANT YEAR in the history of the chemical industry. As Part I, a review of the large companies, indicated, it was a year of peak sales, profitable operations, heavy construction and active financing.

TURNING to a group of medium size companies with sales from 20-50 million, one finds a very similar situation to that of the larger companies, with almost equivalent sales increases, slightly better profit ratios, not quite such heavy construction, but equally active financing.

Fig. 1 shows sales of twelve medium size companies. With regard to the relative increases over 1946 sales, Harshaw Chemical Co., manufacturers, importers and jobbers of industrial chemicals, showed the largest increase, 50.2%, as is shown by Table 1. In fact this was the largest increase in either group. The smallest increases were recorded by the fertilizer and pharmaceutical groups, the latter largely as a result of price declines in antibiotics. Charles Pfizer in fact reported a drop in sales. The sales increases of the other medium size companies ranged from Mathieson's 20% to Hooker's 35.6%, very closely approximating the range of increase of most of the large companies.

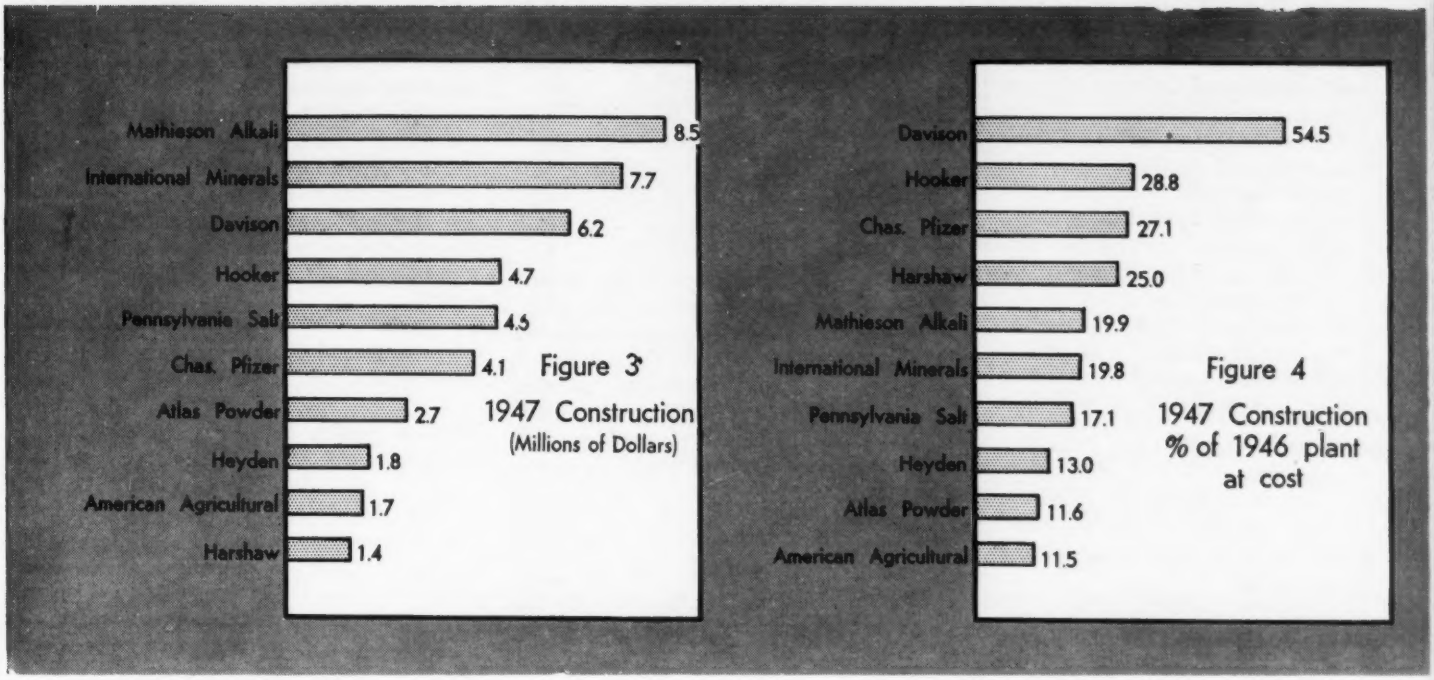
Fig. 2 shows that the year was a profitable one for the medium size companies. Charles Pfizer, the one company reporting smaller sales, showed net profit after taxes of 23.9% of sales, the highest of all the companies studied. Mathieson Alkali was second at 12.7%, and Heyden third at 12.4%, followed by four companies clustered between 10.5% and 11%, giving the medium size company group as a whole a slightly better profit picture than that of the large companies. Two fertilizer companies were among those with lower profits, and Harshaw Chemical, which had the largest sales increase for either group, had the lowest profit percentage, 4.3%.

Construction by the medium size companies ranged from 1.4 million by Harshaw to 8.53 million by Mathieson, as is indicated by Fig. 3. Fig. 4 shows construction as a percentage of 1946 plant. Davison was far in the lead with 54.5%, largely as a result of its

Table I—Percentage Increase in Sales

Company	%
Harshaw	50.2
Hooker	35.6
Westvaco	34.2
Atlas Powder	28.0
Penn. Salt	27.5
International Minerals	20.1
Mathieson Alkali	20.0
Heyden	15.9
American Agricultural	11.4
Davison	9.0
Charles Pfizer	—10.3

*Monsanto Chemical Co., respectively Everett, Mass., and Washington, D. C.



purchase and improvement of the Florida phosphate rock mining properties of the Southern Phosphate Corp. for $4,692,000 and its purchase of a War Assets synthetic catalyst plant in Cincinnati for $870,000. Following Davison were Hooker, Pfizer, and Harshaw at 28.8%, 27.1% and 25% respectively. Construction for the remainder ranged from 11.5% to 19.9%, the expansion for the group as a whole being slightly less than that of the large companies.

The large construction programs resulted in active financing by the medium size companies as well as the large ones. Among the smaller firms as well as in the large, the emphasis was on fixed-rate financing with preferred issues and bank loans the most popular. Chas. Pfizer, Pennsylvania Salt, Westvaco, and Victor had preferred issues, and bank credit was obtained by Atlas, Harshaw, Davison, and Mathieson. Heyden had a 15 year 2⅞% debenture issue. Despite the emphasis on fixed rate financing, there were three common stock issues: by International Minerals, Hooker, and Westvaco, the latter also having a preferred issue.

OIL COMPANIES

The trend toward increasing competition from oil companies became even more apparent in 1947.

The Shell Chemical Corp. completed new plants for isobutyl ketone and methyl isobutyl carbinol and enlarged facilities for isopropyl alcohol, acetone, and hydrogen; and will complete its synthetic alcohol and glycerine plants in 1948. Its construction program has been enlarged to include ammonia, various alcohols and ketones, and their derivatives. The Shell Development Corporation research emphasis has been shifted to detergents, plastics, and resins. Promising agricultural chemicals were synthesized.

Of probably more significance were the announcements of the Standard Oil Co. (Indiana). Stanolind reported not only some interesting new research developments, but also that it is ready to build near the Hugoton Gas Field in Southwestern Kansas a plant for liquid fuels and chemicals from natural gas utilizing the hydrocarbon synthesis process. It has completed plans for two by-product chemical refining plants, one near the Hugoton plant and one near the Brownsville, Texas plant of Carthage-Hydrocol, which will produce "large quantities of ethyl alcohol, acetic acid, and other industrial chemicals." Thus, there will be not only oil company vs. chemical company in the chemical field, but oil company vs. oil company. What effect this competition will have on the price structure of such chemicals as ethyl alcohol is interesting to conjecture.

Standard Oil (California) continued its chemical expansion with emphasis on production of a detergent for national distribution to soap companies.

OTHER "NON-CHEMICAL" COMPANIES

Other "non-chemical" companies expanded further into the chemical field, including Eastman Kodak, Celanese, Koppers, Corn Products Refining, and General Electric.

Eastman Kodak and its chemical subsidiary Tennessee Eastman reported a $12,600,000 expansion at Kingsport, Tennessee, with increased facilities for isopropyl acetate, ethyl acetate, triethyl phosphate, cellulose esters, acetate staple fibre, acetate yarn, acetate dyes, and acetic acid either underway or completed. New research development included new acetate dyes, new triethyl phosphate insecticides, a cellulose acetate propionate plastic (Tenite III) and new hydroquinone derivatives. Also first preparation of "isotopic" methyl iodide and synthesis of Vitamin A. Research facilities expansion is continuing.

Celanese's expansion included in addition to its yarns and fibres expansion additional propyl, isopropyl, and butyl alcohol units at Bishop, Texas, added cellulosic plastic facilities at Belvedere, New Jersey, and a cellulose acetate packaging materials expansion at Newark. In order to be assured of raw materials, Celanese obtained forest rights in British Columbia and will erect a cellulose plant near Prince Rupert.

Koppers moved further into the plastics field by purchasing the Manufacturer's Chemical Co. and its sales subsidiary Chemaco Corp. Koppers is also constructing an oil cracking ethylene plant, expanding polystyrene and converting an oil refinery to synthetic organic chemicals. A new plant in Kearny, N. J., produces hydrogen sulfide, hydrogen cyanide, and sulfuric acid from coke oven gas.

Corn Products Refining Co. reported the formation of a completely integrated Chemical Division with the following operating departments: research, engineering, sales development, and market research and development. Although it will have many functions, the

new division's main activity wil be the development of new products, much of it applied "chemurgy," the utilization of agricultural products for industrial applications.

General Electric reported completion of increased facilities for four of its major chemical products: silicones, alkyd resins, laminated plastic materials, and molded plastic products. New developments include a heat-resistant molding compound, a solventless cold-setting resin, improved glyptals and new silicone applications. G. E. is still operating the Hanford, Washington atomic energy plant.

RESEARCH

1947 was an active year for research, and also a year in which many companies reported their research expenditures.

Research expenditures as a percentage of sales are shown for 11 companies in Table 2. It is seen that for the majority of the chemical companies reporting, the expenditures averaged about 2-2.5% of sales. In companies where pharmaceuticals seem to be an important phase of the business, the percentage seems to be higher, as is indicated by American Cyanamid, 5.4%; Merck, 4.9%; and Heyden 3.9%. There seem to be insufficient data to indicate definitely whether expenditures in the larger companies run higher than the 2.0-2.5% range.

The rapid expansion of research facilities continued. Completed were Allied's new research lab at Morristown, N. J.; Air Reduction's new mechanical lab at New Providence, N. J.; Celanese's new central research lab at Summit, N. J.; Mathieson's new pilot plant building at Niagara Falls; Corn Products' new pilot plant building at Argo, Ill.; and extensive additions to Atlas Powder's central research laboratory. Under construction were Air Reduction's new liquefaction lab at Stamford, Connecticut, Merck's new research and development laboratories, Corn Products' new research building at Argo, an addition to Eastman's Synthetic Organic research laboratory, and Tennessee Eastman's new research building at Kingsport, Tennessee. Additional equipment and facilities were reported by USI, Davison at its new research lab, Celanese at its Clarkwood, Texas, research and development center, and by Du Pont which postponed much of its expansion program because of excessive costs. New authorizations included an addition to the Merck Institute for Therapeutic Research and a $1,800,000 expansion by Commercial Solvents. Westvaco mentioned its newly established entomological laboratory.

Research activities in 1947 covered many fields, and many developments were reported. One of the most interesting was the announcement by Charles Pfizer of crystalline procaine penicillin, "most significant advance yet made" in the search for a penicillin form which will produce prolonged blood-levels of penicillin in the body.

Table 2—Research Expenditures, 1947

Companies	Research Expenditures Dollars	% Sales
Amer. Cyanamid	11,510,000	5.4
Merck	3,362,000	4.9
Heyden	851,000	3.9
Hercules	3,600,000	2.7
Penn Salt		2.5
Victor	500,000	2.3
Hooker	458,000	2.3
Westvaco	560,000	2.2
Atlas Powder	770,000	1.9
Celanese	2,825,000	1.6
Davison	257,000	1.0

PETROLEUM CHEMICALS

The field showing the most extensive and significant developments of the year was probably that of petroleum chemicals and chemicals from natural gas.

Shell's active expansion program has already been reviewed, as have Stanolind's significant plans for a synthetic fuels and chemicals plant from natural gas.

In addition, Dow signified its intention of keen competition by purchasing two government plants at Velasco, Texas, as well as a natural gas field near Matagorda, and forming the Brazos Oil and Gas Co. to exploit the latter.

American Cyanamid announced completion by the Jefferson Chemical Co. (owned equally with The Texas Co.) of its initial plant near Port Neches, Texas, for ethylene dichloride, ethylene oxide, and ethylene glycol.

Celanese reported additional units including propyl, isopropyl, and butyl alcohols at Bishop, Texas; and Union Carbide reported expansion of its Texas City plant. In California, Standard Oil continued expansion emphasizing detergents, and in Pennsylvania, Koppers announced construction of an oil-cracking ethylene plant.

PLASTICS

Plastics were one of the most widely mentioned fields in the annual reports, with almost every type represented.

In the field of cellulose plastics, Du Pont reported expansions in cellophane and nitrocellulose, Hercules in cellulose acetate, Celanese in cellulose acetate and cellulose plastics, and Tennessee Eastman in cellulose esters. Tennessee Eastman also announced Tenite III, cellulose acetate propionate.

Other resins and plastics expanded included acrylic resins and polythene plastics by Du Pont; vinylite film by Union Carbide; Lustrex (scald-resistant plastic), phenol-formaldehyde, and polyvinyl chloride by Monsanto; polystyrene by Koppers; and alkyd resins, laminated products, and molded plastics products by General Electric which also reported a new heat-resistant molding compound and a solventless cold-setting resin.

Companies reporting expansion in unspecified plastics and resins include Union Carbide, Hercules, and USI (two plants).

Koppers' purchase of the Manufacturer's Chemical Company and its sales subsidiary, Chemaco Corp., gave Koppers both a factory outlet and a distribution center, thereby greatly improving its position in the field.

PHARMACEUTICALS

Pharmaceutical chemicals, paced by the antibiotics, had another advancing year.

Despite the indications of a balance in supply and demand given by falling prices, the expansion of antibiotic facilities is still being pushed. Pfizer leased a Government fermentation plant at Terre Haute, Indiana, for 20 years to use for penicillin and streptomycin. Merck authorized increased antibiotic finishing and packaging facilities and expanded penicillin facilities; and Commercial Solvents a $300,000 penicillin expansion; Heyden reported a commercial process for streptomycin.

Pfizer's development of procaine penicillin has already been mentioned. Other developments include Monsanto's announcement of penicillin precursors and Commercial Solvents' pilot plant production of bacitracin.

Non-antibiotic developments included Heyden's purchase of Nyal Company, nationwide drug distributors; Merck's authorization of an expansion of the Merck Institute for Therapeutic Research; American Cyanamid's expansion of folic acid products; Distillation Products' (Eastman Kodak and General Mills) synthesis of Vitamin A.

AGRICULTURAL CHEMICALS

Agricultural chemicals were again prominent with both expanded facilities and promising new products reported.

In addition to expansions in fertilizer materials, there were expansions in Niphos T insecticide and 2,4-D weed killer by Monsanto, benzene hexachloride by Commercial Solvents and Penn Salt (pilot plant completed), DDT by Penn Salt and Hooker, and vitamin feeds by Commercial Solvents.

Several companies reported research on new insecticides, including Hercules on Toxaphene, USI on pyrenone concentrates, and Eastman Kodak on insecticides using triethyl phosphate.

Shell reported promising tests at the Modesto, Calif. agricultural lab; and Westvaco mentioned its new entomological lab.

Several companies reported fungicide expansions, including Lake Chemical Co. (Harshaw Associate) and Standard Oil (Indiana).

MISCELLANEOUS CHEMICALS

There were many other chemicals which figured prominently in the year's progress.

Caustic soda and chlorine were the most frequently mentioned single chemicals, expansions being reported by Southern Alkali (American Cyanamid and Pittsburgh Plate Glass), Hercules Powder, Pennsylvania Salt, Mathieson Alkali, Heyden, and Hooker. Sulfuric acid was also mentioned by several, including Du Pont, International Minerals, and Koppers, the latter plant using hydrogen sulfide as raw material.

Elemental phosphorous developments indicate keen competition ahead in the phosphate field. Victor began operation of a new furnace plant in Florida; Monsanto began construction of a fifth furnace; and Westvaco announced a decision to build an elemental phosphorous plant near Pocatello, Idaho.

The yarn and fibre field remained active with expansions reported by Du Pont, Celanese, and Tennessee Eastman.

Other products mentioned by two or more companies included hydrogen by Heyden and Shell; monochlorbenzene by Heyden and Pennsylvania Salt; synthetic methanol by Du Pont and Commercial Solvents; ethylene glycol by Du Pont and Jefferson; detergents by Du Pont, Monsanto and Standard Oil (Calif.); dyestuffs by Du Pont, American Cyanamid and Eastman; monochloroacetic acid by Ohio Chemical Corp. (Harshaw associate) and Hooker; and dry ice by USI and Mathieson Alkali.

LOCATION

The location pattern for plant expansions in 1947 was very similar to that in 1946. New Jersey was still most frequently mentioned with expansions reported in 10 communities, about one-half of them plastics expansions. Because of the many developments in petroleum chemistry, Texas was second, with 6 communities mentioned. Other states mentioned several times include California, Florida (mostly phosphate expansions), Illinois, Indiana, Louisiana, Pennsylvania, Virginia and Tennessee.

With regard to important individual cities, Niagara Falls had 3 reported expansions. Several cities were mentioned twice, including Newark, N. J.; Terre Haute, Ind.; and Lake Charles, La.

Developments in Individual Companies

CELANESE

Sales: $181,000,000 (all time high) vs $135,000,000 in 1946.
Profit Before Taxes: $40,000,000.
Profit After Taxes: $24,200,000.
Expansion: $36,500,000 (1946 plant: $139,000,000).
Expanded Facilities: Additional units at company's Bishop, Tex., chemical plant, including units for normal propyl, isopropyl, and butyl alcohols. Modernization of Cumberland, Md., cellulose acetate and filament yarn plant. Expansion of Narrows, Va., cellulose acetate flake, staple fiber, and filament yarn plant. New Rock Hill, S.C., cellulose acetate filament yarn plant begun. Construction on cellulose plastic facilities at Belvidere, N. J. Expansion of cellulose acetate packaging materials at Newark. Expansion of fabric plants at Bridgewater and Staunton, Va.

Forest management license with cutting rights to large forests leased from government of British Columbia. Cellulose plant to be erected near Prince Rupert, B.C. Watson Island, former U.S. Army supply base with deep-water wharfage and transcontinental rail and highway connections, acquired for plant site.
Research: $2,825,000 spent for research in cellulosic chemistry and petroleum chemistry. New central research lab at Summit, N. J., opened. New facilities added at company's petroleum chemicals research and development center at Clarkwood, Tex.
Financing: $25,000,000 two year stand-by bank credit, 70% repayable semi-annually from 1949 to 1954, the balance in 1954.
Mexican Operations: Celanese Mexicana S.A. plant for cellulose acetate filament completed at Ocotlan, State of Jalisco. Construction underway on viscose yarn plant of Viscosa, Mexicana. S.A. at Zacapu, State of Michoacan.

KOPPERS

Sales: $162,900,000 vs. $112,700,000 in 1946.
Profits Before Taxes: $12,970,000.
Profits After Taxes: $7,510,000.
Construction: $11,400,000 vs. $10,100,000, major portion in connection with chemical Division.
Facilities Expanded: Oil refinery at Oil refinery at Oil City, Pa., purchased from City, Pa., purchased from War Assets, being converted to synthetic organic chemicals and currently producing alkylated phenols. New plant at Kearny, N.J., for hydrogen sulfide and hydrogen cyanide from coke oven gas and sulfuric acid from the hydrogen sulfide. Manufacturer's Chemical Co., which compounds and colors plastics, and its sales subsidiary, Chemaco Corp., acquired through an exchange of stock, thus giving Koppers factory outlet and distribution center and enabling it to supply cellulose acetate and ethyl cellulose. Oil-cracking ethylene plant under construction at Kobuta for additional styrene monomer production. Polystyrene expansion started.

Work continuing with Air Reduction and Bethlehem Steel on construction of low-purity oxygen-producing facilities at Bethlehem's Johnstown plant.
Foreign: Contract with Cia de Acero del Pacifico to supervise engineernng construction, and operation of the first integrated steel plant in Chile.
Research: Substantial amounts of time and money to be devoted to the making of synthetic gasoline and chemicals from coal.

INTERNATIONAL MINERALS & CHEMICALS CORP.
(Year ended June 30)

Sales: $41,300,000 (all time high) vs. $34,400,000 in 1946.
Income Before Taxes: $5,852,000.
Income After Taxes: $3,827,000.
Construction: $7,740,000 (1946 plant $39,100,000).
Facilities Completed: Amino products plant at San Jose, California; Achan phosphate mine in Florida; sulfuric acid plant at Spartanburg, South Carolina; fertilizer mixing plant at Pensacola, Florida; and an acidulating plant at Mason City, Iowa.
Financing: $4,050,000 in common stock.
Research: New and improved mining processes. New processes developed for chemical grade potassium chloride and potassium sulfate. Sugar beet research. New improved sodium glutamate processes ready for pilot plant.

ATLAS POWDER CO.

Sales: $41,200,000 (peacetime high) vs. $32,200,000 in 1946.
Income Before Taxes: $3,470,000.
Income After Taxes: $2,270,000.
Expansion: $2,700,000 (1946 plant $23,200,000).
Expanded Facilities: Sorbitol plant at Atlas Point placed in operation. Sorbitol and mannitol derivatives unit under construction.
Construction Policy: Defer all projects except safety, necessary repairs and replacements and outstanding cost reductions.
Financing: $5,000,000 bank credit with 2% loans repayable semiannually in 12 installments, beginning June 30, 1950. $3,000,000 borrowed in 1947. Increase in common 500,000 shares to 700,000 shares authorized.
Research: $770,000. Extensive additions to central research laboratory completed midyear at Wilmington.

AMERICAN AGRICULTURAL CHEMICAL CO.
(Year ended June 30)

Sales: $41,100,000 vs. $36,900,000 in 1946.
Income Before Taxes: $7,150,000.
Income After Taxes: $4,450,000.
Expansion: $1,710,000 (1946 plant $14,900,000).

CHARLES PFIZER & CO.

Sales: $39,200,000 vs. $43,700,000 in 1946.
Income Before Taxes: $15,550,000.
Income After Taxes: $9,350,000.
Expansion: $4,070,000 (excluding Citro Chemical purchase). (1946 plant app. $15,000,000).
Expanded Facilities: Citro Chemical Company of Maywood, N. J., manufacturers of caffeine, acetophenetedin and acetanilid, purchased for $768,945. U. S. Government's Vigo Plant, modern fermentation plant at Terre Haute, Indiana, leased for 20 years; to be used for streptomycin and penicillin. Power facilities and citric acid plant under construction at Groton, Conn.
Financing: $20,000,000 3½% cumulative preferred authorized by stockholders. $5,000,000 sold privately to institutional investors.
Research: Crystalline procaine penicillin, developed in Pfizer laboratories, "most significant advance yet made" in search for a penicillin dosage form which will produce prolonged blood-levels of penicillin in the body; patent applications filed. Streptomycin sulfate improved. Research activities in organic synthesis expanding.

HARSHAW CHEMICAL CO.
(Year ended Sept. 30, 1947)

Sales: $32,000,000 vs. $21,300,000 in 1946.
Profits Before Taxes: $2,194,000.
Profits After Taxes: $1,357,000.
Expansion: $1,400,000. (1946 plant app. $5,600,000).
Facilities Expanded: Shipyard purchased at Gloucester City, N. J. as new plant site for glycerine, metallic soaps, and other facilities now located in Philadelphia. Monochloroacetic acid facilities being constructed at Niagara Falls by

New York-Ohio Chemical Corp., an associated company. Productive capacity for copper fungicides more than doubled by Lake Chemical Corp., another associated company.

Construction Policy: Proceed with certain work at once despite higher costs.

Financing: Retirement of 4½% convertible preferred completed in May, 1947. $3,000,000 bank credit established and utilized. Repayable in fifteen 5% installments from June 30, 1949 to December 31, 1956. Interest rate 1¾% per annum prior to December 31, 1948; 2½% thereafter. Other provisions and restrictions.

PENNSYLVANIA SALT MANUFACTURING CO.
(Year ended June 30)

Sales: $29,200,000 (all time high) vs. $22,900,000 in 1946.

Profit Before Taxes: $4,300,000.

Profit After Taxes: $2,680,000.

Expansion: $4,560,000 (1946 plant $26,600,000).

Expanded Facilities: Portland, Ore., chlorine caustic plant; Portland, Ore., and Natrona, Pa., DDT plants; and monochlorobenzene plant all completed. Benzene hexachloride pilot plant completed at Natrona. Power plant at Wyandotte and anhydrous hydrofluoric acid plant at Easton, Pa., being expanded.

Financing: $5,000,000 in convertible 3½% preferred sold just after end of fiscal year.

Research: 2.5% of sales. 60 chemists and 45 assistants at company's Whitemarsh research laboratories.

DAVISON CHEMICAL CORP.
(Year ended June 30)

Sales: $25,400,000 vs. $23,300,000 in 1946.

Income Before Taxes: $2,981,000.

Income After Taxes: $1,806,000.

Construction: $6,240,000 (1946 plant $11,450,000).

Finance: $5,000,000 bank credit of which $3,000,000 utilized. Maturity date July 31, 1949.

Facilities Expanded: Florida phosphate rock mining properties of Southern Phosphate Corporation acquired and improved at a cost of $4,692,000. Synthetic catalyst plant in Cincinnati purchased from War Assets. (Purchase money mortgage $870,000).

Research: $257,000 in 1947. Staff increased. Consultants retained. New research laboratory equipped. Emphasis on further development of gel-type catalysts and phosphatic compounds.

WESTVACO CHEMICAL CORP.

Sales: $25,100,000 vs. $18,700,000 (gross) in 1946.

Income Before Taxes: $4,310,000.

Income After Taxes: $2,670,000.

Facilities Expanded: New phosphoric acid and phosphate units completed at Carteret, N.J. Rebuilding of South Charleston, W. Va., salt plant underway. Natural soda mine and processing plant near Green River, Wyoming, in initial operation. Decision made to manufacture elemental phosphorous in plant to be constructed near Pocatello, Idaho.

Financing: 3 for 2 common split. $3,000,000 of $3.75 preferred stock. 30,000 shares of common issued after split.

Research: $560,364 in 1947. Newly established entomological lab serviced production and sales of DDT and benzene hexachloride. Special Products Manufacturing Division simplified handling of production of small tonnage specialty chemicals.

MATHIESON CHEMICAL CORP.

Sales: $24,600,000 (all time high) vs $20,500,000 in 1946.

Profit Before Taxes: $5,010,000

Profit After Taxes: $3,130,000.

Expansion: $8,530,000 (1946 plant $42,900,000).

Expanded Facilities: 100% expansion in sodium chlorite at Niagara Falls completed. 40% caustic soda increase at Saltville, Va., practically completed. One-half of a 100% soda ash increase at Lake Charles, La., completed. 30% dry ice expansion underway at Saltville.

Financing: $10,000,000 bank credit established. $5,500,000 borrowed to date.

Research: Significant progress in development of Mathieson stationary mercury cell for electrolytic manufacture of caustic soda, chlorine, and other products. New uses for chlorine dioxide developed. Modern pilot plant building constructed adjacent to Niagara Falls plant.

HEYDEN CHEMICAL CO.

Sales: $21,900,000 (all time high) vs. $18,900,000 in 1946.

Income Before Taxes: $4,360,000.

Income After Taxes: $2,720,000.

Expansion: $1,760,000 (1946 plant $13,560,000).

Facilities Expanded: Nyal Company, nationwide distributors of pharmaceuticals and drug sundries with principal offices in Detroit purchased for $654,000. Additional building in Detroit purchased for pharmaceuticals. Caustic soda, liquid chlorine, hydrogen, monochlor benzene and muriatic acid in production at Memphis plant which was purchased from Government in 1946. All but muriatic new to company.

Financing: $6,000,000, fifteen-year 2⅞% debentures.

Research: $851,000 vs. $516,000 in 1946. Anti-biotic research intensified. Commercial process for streptomycin developed.

Export Sales: $2,475,000.

Government Operations: Operated Morgantown, W.Va., anhydrous ammonia plant, largest source of ammonia in War Department's overseas fertilizer program.

VICTOR CHEMICAL WORKS

Sales: $21,300,000.

Income Before Taxes: $3,660,000.

Income After Taxes: $2,240,000.

Expanded Facilities: New phosphorous electric furnace plant at Victor, Florida, began operation at 50% capacity in November. $1,750,000 expansion at Mt. Pleasant, Tenn., well underway. New $1,500,000 phosphorous conversion plant under construction at Morrisville, Pa. In addition to new construction $950,000 spent on plant improvements, mostly at Chicago Heights, Ill.

Financing: 40,000 shares cumulative preferred sold in July 1947. Revenue: $3,900,000.

Research: $500,000.

HOOKER ELECTROCHEMICAL CO.
(Year ended Nov. 30, 1947)

Sales: $20,200,000 (all time high) vs. $14,900,000 in 1946.

Income Before Taxes: $3,637,000.

Income After Taxes: $2,185,000.

Expansion: $4,745,000 (1946 plant est. $16,500,000).

Facilities Expanded: Electric power, electrolytic cell equipment, caustic soda processing and chlorine liquefaction facilities at both Niagara Falls and Tacoma. Monochloroacetic acid production started. Hexachlorocyclohexane, DDT, chlorinated benzenes, and hydrogen chloride gas facilities enlarged.

Financing: Two-for-one stock split. 134,000 shares of new common sold for $2,729,000 through rights (one-for-five). Common admitted to N. Y. Stock Exchange. Preferred authorized but not issued.

Research: $458,434 vs. $444,393 in 1946.

SHELL

Expanded Facilities: (Shell Chemical Corporation) Chemical construction program expanded to include ammonia, various alcohols and ketones and their derivatives. New plants for methyl isobutyl ketone and methyl isobutyl carbinol, and enlarged facilities for isopropyl alcohol, acetone and hydrogen were completed. 1948 completions to include synthetic alcohol and glycerine plants.

Research: (Shell Development Corp.) With glycerine and ethyl alcohol projects nearing completion, emphasis has been shifted to prepare for the manufacture of detergents, plastics and resins. Promising chemicals for agriculture synthesized for testing at Shell's agricultural laboratory near Modesto, Calif.

STANDARD OIL (INDIANA)

Research: $7,000,000. Extensive research on chemicals from petroleum. Commercial method developed for certain higher alcohols useful in making plasticizers. Pan American Refining at Texas City developed new resin and carried to production scale a petroleum-base drying oil. A new oil-soluble fungicide developed.

Future Expansion: Stanolind now ready to build near Hugoton gas field in southwestern Kansas a plant for liquid fuels and chemicals from natural gas by the hydrocarbon synthesis process. Construction to begin in 1948 and be completed in 1950.

Plans also completed for two chemical plants, one adjacent to new Hugoton plant, the other next to a similar plant being built by Carthage Hydrocol at Brownsville, Texas. With these facilities Stanolind will refine byproduct chemicals producing large quantities of ethyl alcohol, acetic acid, and other industrial chemicals.

STANDARD OIL (CALIFORNIA)

Expanded Facilities: Facilities for the manufacture of petroleum chemicals at Richmond, California, enlarged, the major additions relating to production of a detergent for national ditribution to soap companies.

TENNESSEE EASTMAN CORP.

Expansion: $12,600,000 for cellulose esters and chemicals plants in Kingsport, Tenn.

Expanded Facilities: Facilities for isopropyl acetate, ethyl acetate, triethyl phosphate, and cellulose esters increased. New acetate staple fibre plant, and increased acetate yarn facilities. A new acetate-dyes plant and additional acetic capacity now under construction.

Research: A number of new acetate dyes including two new yellow dyes introduced. Several new insecticides developed with consequent increased use of triethyl phosphate. New all-purpose acetate-filament yarn developed. Notable progress in acetic acid and acetic anhydride synthesis. Tenite III, cellulose acetate propionate plastic introduced. New hydroquinone derivatives announced.

First preparation of "isotopic" methyl iodide completed during the year at Kodak Park. Synthesis of Vitamin A announced by Distillation Products, Inc., jointly owned by Eastman Kodak and General Mills.

Construction of addition to synthetic organic research lab in Rochester begun. Work on new research building at Kingsport is continuing.

GENERAL ELECTRIC CO.

Expanded Facilities: Increased facilities for four of Chemical Department's major products completed in 1947: silicones, alkyd resins, laminated plastics materials, and molded plastics products.

Research: New developments included a heat-resistant molding compound, a solventless cold-setting resin, improved Glyptals for enamels, and new silicone applications.

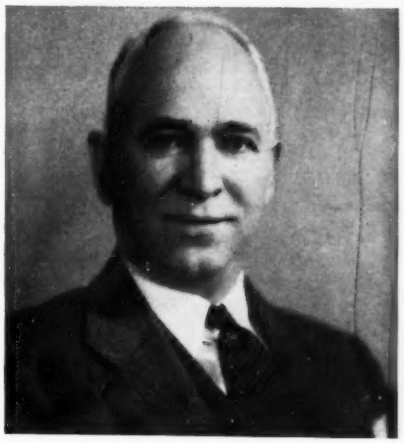
CORN PRODUCTS REFINING CO.

Research: A completely integrated chemical division has been organized for research and development. The following operating departments are functioning: research, engineering, market research and development, and sales development. The sales development department consists of Mellon Institute Fellowship to investigate industrial applications of byproduct chemicals. Functions of division include improving processes and quality, cooperating on equipment and control problems and developing automatic and electronic controls, but main efforts are devoted to development of new products, applied chemurgy, the utilization of agricultural products for industrial applications. Products under study include zein, calcium phytate and inositol, pharmaceutical products. New pilot plant building in partial use and adjoining research building under construction.

THE CHEMICAL PANORAMA

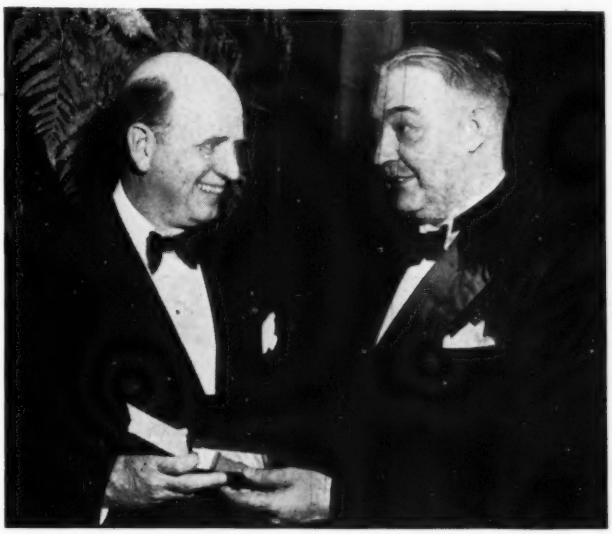
NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE



Lawrence H. Flett, recently elected president of the American Institute of Chemists.

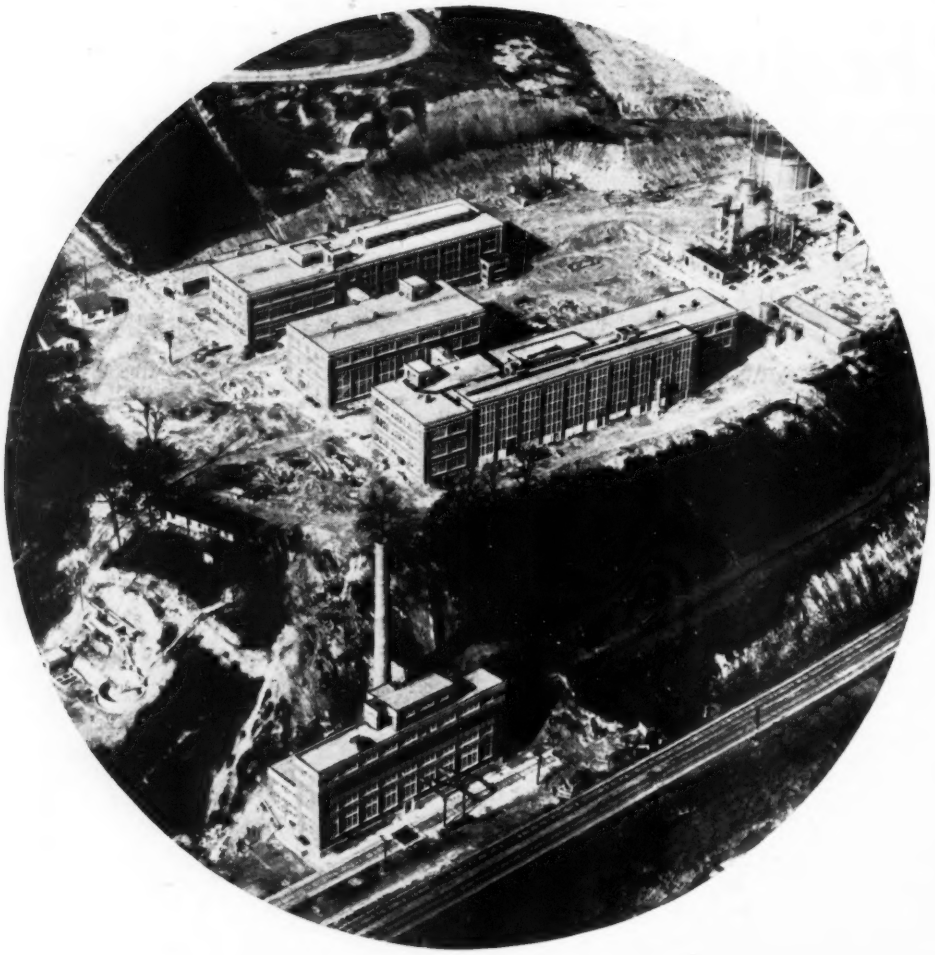
Walter W. Carre, Jr., new manager of U.S. Industrial Chemicals' Brownsville plant.



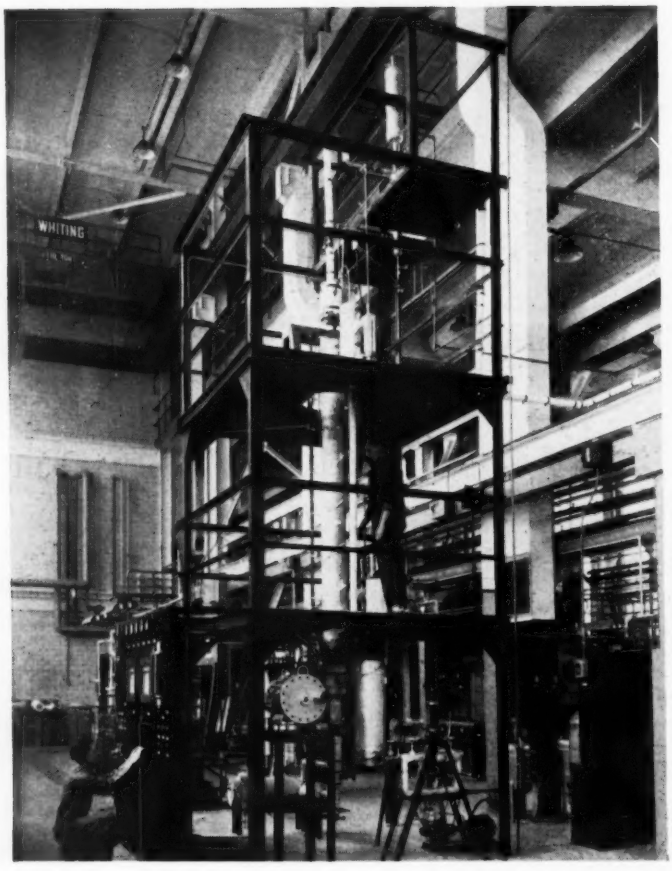
Charles Allen Thomas (left), executive vice president of Monsanto Chemical Co., receives the gold medal of the American Institute of Chemists. Foster D. Snell, retiring president of the Institute, presents the medal to Dr. Thomas.

Charles S. Munson, recently elected president of the Manufacturing Chemists' Association.

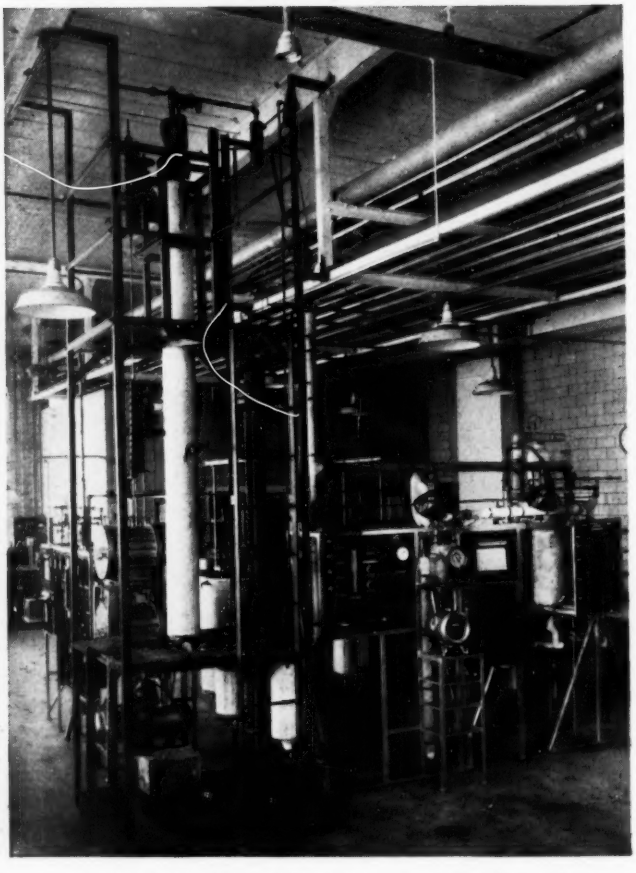
John D. Cochrane, Jr., receiving the John Wesley Hyatt Award for achievement in plastics. Pictured left to right, President Truman, Senator Johnson, Mr. Cochrane, Senator Holland, and Mrs. Cochrane.



Air view of synthetic liquid fuels laboratories at Bruceton. Gas synthesis building at left, administration building, center, and coal hydrogenation building, right. Boiler plant in foreground and gas plant at rear of lab buildings.



Gas synthesis internally-cooled pilot plant. The unit has complete facilities for research investigations of the Fischer-Tropsch process.



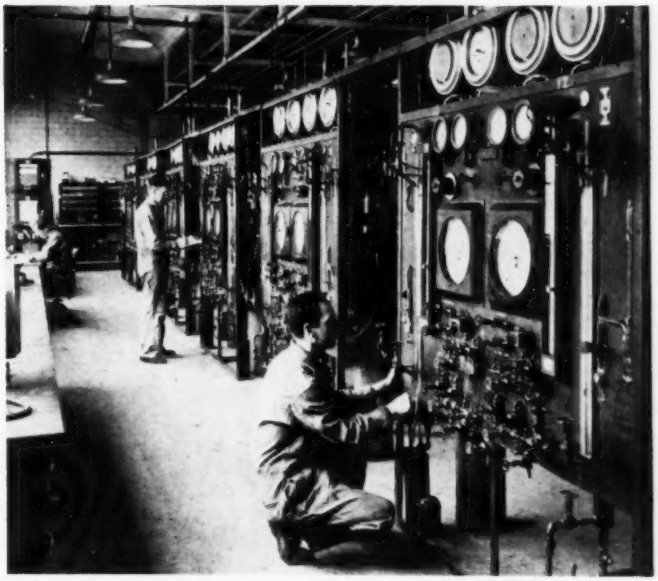
Gas synthesis liquid-phase pilot plant. Special safeguards prevent a dangerous accumulation of carbon monoxide and hydrogen.

Oil from Coal

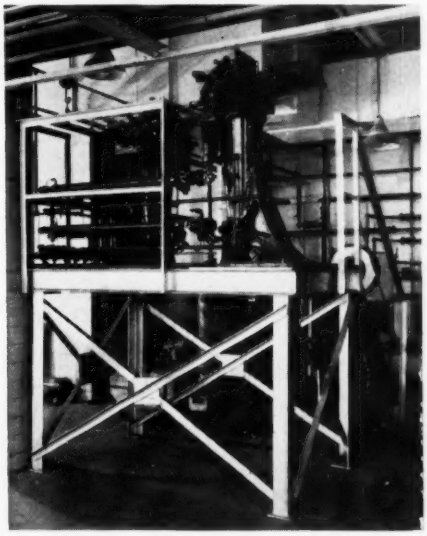
The Bureau of Mines recently opened new $3.5 million synthetic liquid fuels laboratories and pilot plants at Bruceton, Pa. Two basic processes for converting coal to oil are being studied there—the gas synthesis or indirect Fischer-Tropsch process, and the direct hydrogenation of coal or Bergius process. As improved by the bureau these are complementary rather than competitive processes.

The laboratories are an integrated unit, and provide the most modern facilities for analytical work, engineering design, drafting and service. The major buildings (shown at left) are connected at the second floor level by bridges to facilitate operations.

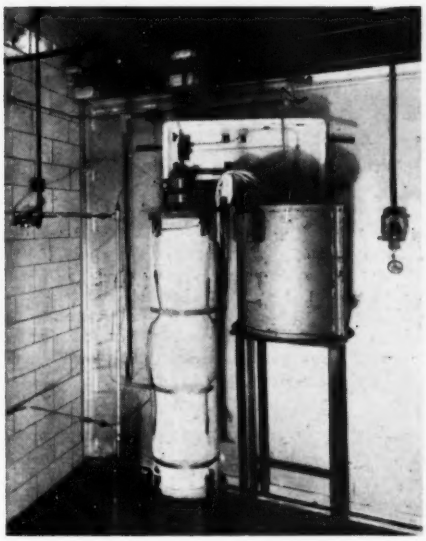
Special precautions have been taken against accidents, as carbon monoxide and hydrogen, the gases used in the process are both poisonous and explosive. Electrically operated windows are automatically fixed open during operation and large fans will sweep escaping gases out of the building in a matter of minutes. High temperature and pressure equipment are isolated from the rest of the works.



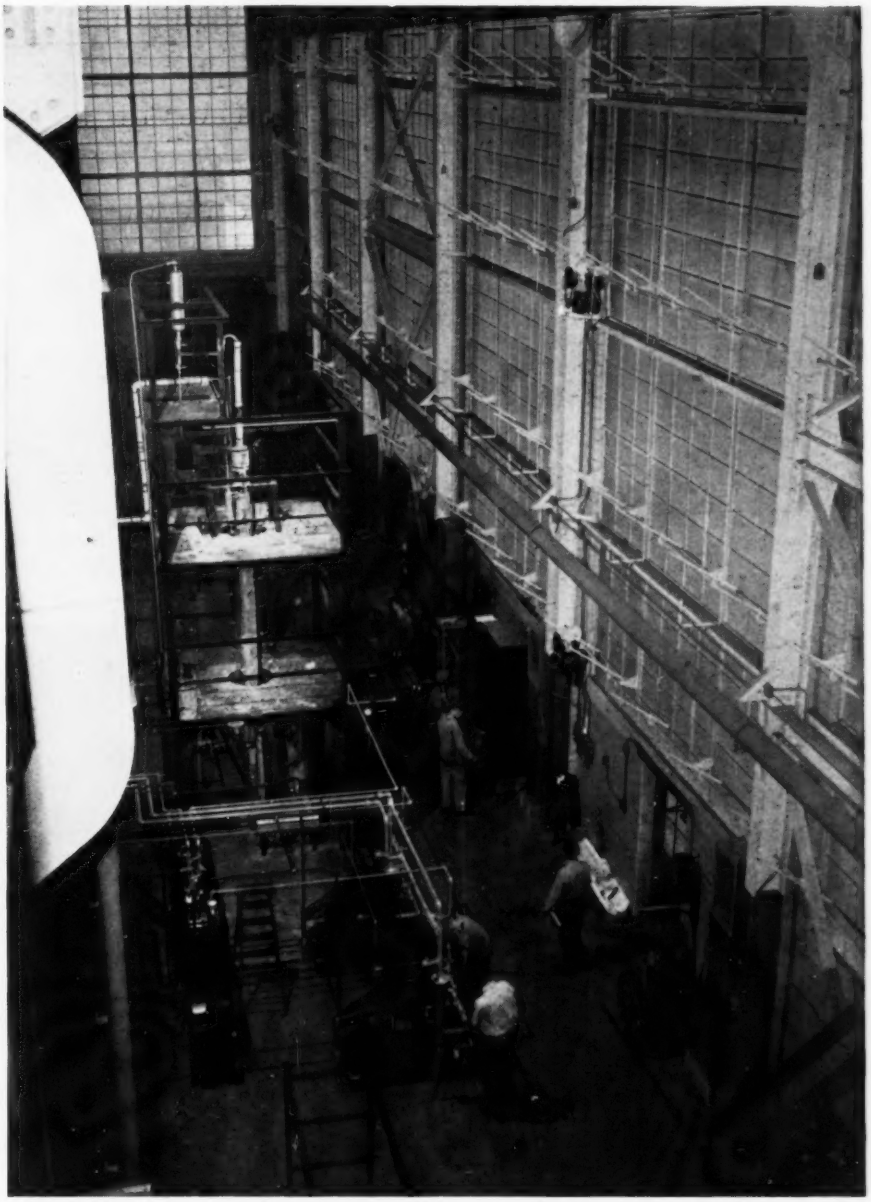
Catalyst testing laboratory. A number of catalysts can be checked under carefully controlled, automatically maintained conditions.



The pump and compressor room on the first floor of the coal hydrogenation building.



New dry coal-hydrogenation unit which may eliminate costly paste preparation steps.



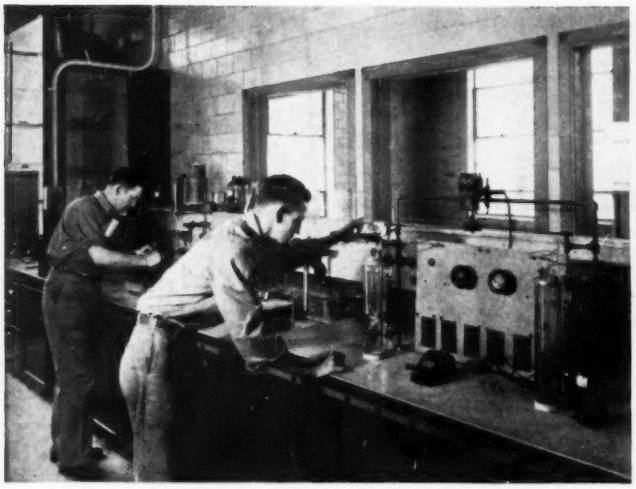
Explosion-proof pilot plant area with steel reinforced wall and bays. The lower 6 feet of the outer wall are of thin transite, so that the wall will blow outward in an explosion.

Two New Labs

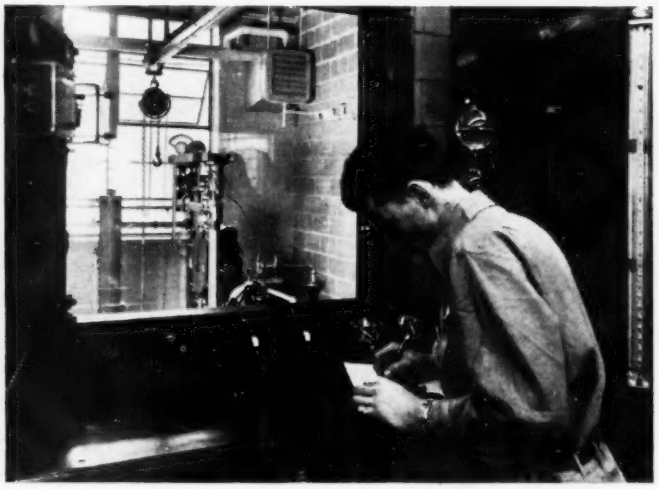
Both American Anode, Inc. and Monsanto Chemical Co. have opened new laboratories. American Anode, manufacturer of latices and mixes of crude and American rubbers, has its lab for the development of rubbers at Akron, Ohio. Here rubber compounds for many uses, from children's toys to work gloves, are investigated.

Monsanto's lab at St. Louis, is prepared to offer technical service of all kinds—the usual chemical analyses, full-scale engine tests. Engine facilities include five Chevrolet test stands, two single-cylinder Caterpillar diesel stands, and twelve Lauson single engines, used to screen-test for the larger engines.

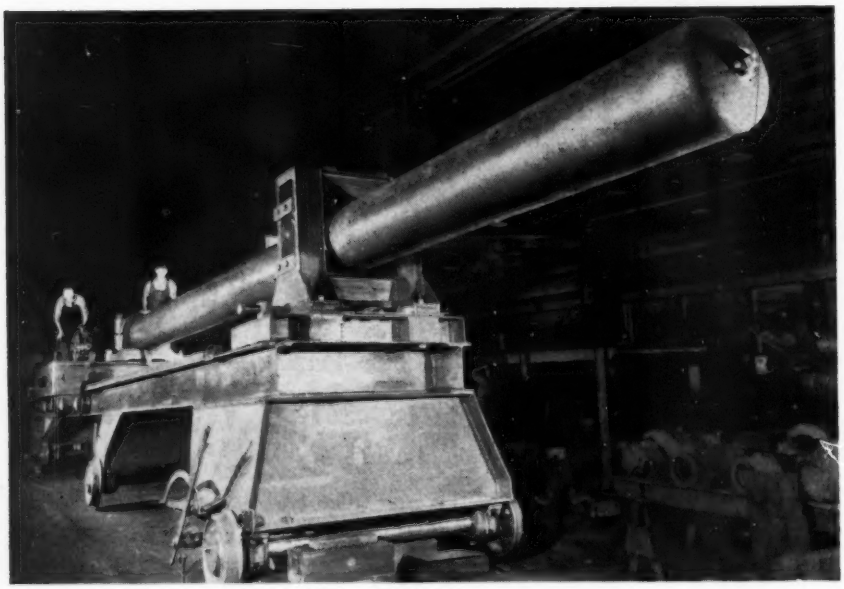
E. William Haley, Jr., prepares a glove by the coagulant-deposition process in the developing laboratory of American Anode, Inc., employing a newly developed rubber compound.



Viscosimeter, in foreground, and electrometric titration apparatus are part of equipment in Monsanto's analytical laboratory.



The test control arrangement of Monsanto's petroleum chemicals laboratory, taken during running of a 36-hour CRC L-4 Chevrolet test.



Rotary kilns are now suitable for ore nodulizing, thanks to boring bars such as these. The length of the bar is forty feet and it is mounted on a motor-driven carriage.

Kiln Cleaner

Allis-Chalmers Manufacturing Co. now has large boring bars for cleaning rotary kilns. These consist of water-cooled tubes about 20 inches in diameter to the end of which are bolted cutting edges. A bar so made can then be slowly inserted into a rotating kiln where it cuts off the fused materials adhering to the lining. This accumulation of material in the kiln's burning zone would eventually build up and render the kiln inoperative if not removed.

No doubt, the steadily increasing good health of the American people is largely due to the extensive enrichment program of the food manufacturers. In the enrichment and production of many food products, Victor* Phosphates play important and varying roles. Cereals, flour, prepared mixes, and food beverages, for example, are enriched with essential calcium, phosphorus, and iron by the addition of Victor calcium and iron phosphates. Victor calcium phosphates are also used to provide the necessary leavening acid in prepared flour mixes.

A Helping Hand for the FOOD INDUSTRIES

for 50 years
VICTOR
CHEMICALS
for everyday Living

*TRADE MARK

Victor chemicals employed in the food industry include:

Monocalcium Phosphate . . . mineral supplement, leavening acid, baking powder.

Phosphoric Acid . . . yeast, sugar, soft drinks, imitation jellies, gelatine.

Sodium Acid Pyrophosphate . . . acid ingredient in commercial baking powders, prepared doughnut and cake flours.

Ammonium Phosphates . . . yeast, vinegar, yeast food.

Dicalcium Phosphate . . . mineral fortification.

Disodium Phosphate . . . process cheese, condensed milk.

Hicalcium Phosphate . . . calcium-enriched flour and bread.

Iron Phosphates . . . mineral enrichment.

Tricalcium Phosphate . . . conditioning salt, soda, and powdered sugar.

VICTOR CHEMICAL WORKS, 141 West Jackson Boulevard, Chicago 4, Illinois

NEW PRODUCTS & PROCESSES

Enamel Opacifier NP 672

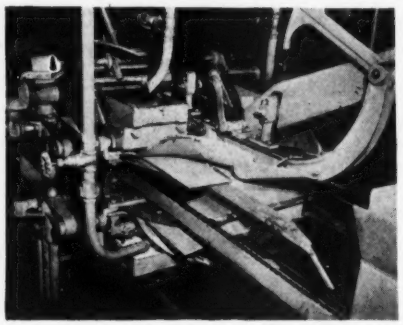
A new zirconia base opacifier for porcelain enamel has been placed on the market by the Rohm and Haas Co. The new product, known as Lufax 77A, is designed primarily for zirconia opaque enamels and contains a mixture of controlled crystalline phases of zirconia, which, in addition to imparting opacity, provide nuclei for the crystallization of zirconia from the molten enamel. Porcelain enamels opacified by Lufax 77A are characterized by unusual stability; gloss and opacity remain constant over a wide firing range and color is stabilized in the desirable blue quadrant. It has proved particularly effective in those enameling plants where firing conditions tend to be somewhat variable.

Case Sealing Glue NP 673

A new shipping case sealing adhesive designed especially for automatic case sealing machines is Boxseal Glue. It will seal the flaps of Fourdrinier kraft, cylinder kraft and jute lined corrugated containers, as well as the solid fibre types. It can also be applied by hand brushing.

Boxseal is described as a liquid converted starch derived adhesive. The method of manufacture increases the adhesive power obtainable from the raw materials. It enables the glue to coat a thinner, more cohesive film on the container board without excessive penetration into the board fibres. The glue remains on the surface to make positive contact with the container flaps when they are pressed together.

Boxseal remains in a fluid condition indefinitely, permitting it to be piped



directly to the machine glue pans without danger that the adhesive will solidify in the pipes and cause stoppages. The accompanying photograph illustrates the method of piping the case seal adhesive from an overhead reservoir, or from the floor above, to the four glue pans located on automatic case sealing machines.

The four valves can be operated to give a continuous trickle of glue into the pans to keep them filled at all times. This adhesive does not crust or foam over and contains no silicate or any inorganic fillers to cause wear on the roller applicators. It is absolutely non-toxic, odorless and free from staining tendencies, making it ideal for food container uses. Boxseal is being produced in commercial volume by Paisley Products, Inc., and is available in 55 gallon drums and 5 gallon pails.

Electrodeposition on Magnesium NP 674

A successful new process developed by Dow Chemical Co. for depositing a thin film of zinc on magnesium permits for the first time the electroplating of magnesium by essentially standard techniques.

Electrodeposits of any of the commercially plated metals, such as chromium, silver, gold, copper, brass, cadmium or zinc, now may be applied to any commerical magnesium alloy.

The initial stages in plating magnesium are specifically to remove contamination and provide the correct reactive surface for promoting good adhesion and a continuous deposit. This treatment is followed by a bath which deposits an extremely adherent thin zinc film on the surface of the magnesium. From this point on, all plating is done in commercially used baths and is typical of plating a variety of finishes on any metal. Actually the same number of steps are involved for plating on magnesium as for plating on other metals.

Excellent adhesion, wear and resistance to accelerated corrosion have been obtained. Parts have been hammered and severely rubbed without lifting the deposit, and the finish has withstood heat, humidity and salt spray tests satisfactorily.

Starch Swells at Low Temperatures NP 675

A new type of starch, Clear Flo, swelling at considerably lower temperatures than ordinary starches, and which gives clear, stable and unusually viscous pastes has just been announced by National Starch Products Inc.

Available in both high and low viscosity grades, Clear Flo starches are easily prepared by merely adding hot water to a suspension of the starch in cold water. The pastes obtained range from opaque to very clear depending upon the temperature of the water used. The unusually high water-taking ability of Clear Flo starches permits considerable dilution with but slight loss of body.

The unusual clarity, stability, high viscosity and ease of preparation of the Clear Flo starches suggests their application for a wide range of industrial uses, such as a desensitizing gum in lithography, as a paper-sizing in-

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (6-8)

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 672	NP 675	NP 680	NP 685	NP 690
NP 673	NP 676	NP 681	NP 686	NP 691
NP 674	NP 677	NP 682	NP 687	NP 692
	NP 678	NP 683	NP 688	NP 693
	NP 679	NP 684	NP 689	NP 694

(Please print)

Name ..... (Position) .....

Company .....

Street .....

City ..... Zone ..... State .....

Celanese* Tricresyl Phosphates

CELLUFLEX*

LINDOL*

Celluflex and Lindol, tricresyl phosphates produced by Celanese Corporation of America, offer a wide range of chemical and physical characteristics for many industrial uses. These organic phosphates were first produced commercially in this country by Celanese. They are non-flammable, non-hygroscopic, odorless, clear, oily liquids—miscible in all proportions with most solvents and diluents.

PLASTICIZERS

Celluflex, produced from petroleum base cresylic acid, and coal tar based Lindol, combine excellent solvent power and flame retardant properties, making them ideal as general plasticizers for vinyl resins, cellulosic and resinous plastics and coating materials. They are exceptionally advantageous for coatings and films where extra flame resistance and toughness are desired. Various grades of these products are specially prepared to meet specific requirements.

OTHER USES

Hydraulic Fluid: Specially compounded Lindol H.F. is widely used as a non-flammable hydraulic fluid—particularly in the die casting industry. Mineral oil hydraulic fluids using Celluflex as a wear reducing additive are now being used extensively.

Lubricant Additive: Lindol H.F. is an important high film strength additive employed to reduce wear and dissolve resinous deposits in heavy duty motor oils designed expressly for automotive, aircraft and specialized industrial uses.

Dust Adhesive: Lindol is also used extensively as a non-flammable dust adhesive in air filtering systems.

Emulsions: Emulsions of these products are available for both oil in water and water in oil applications.

For further information on properties and uses of Celluflex, Lindol and other Celanese Organic Chemicals, and working samples, write to

CELANESE CORPORATION OF AMERICA
Chemical Division
180 Madison Avenue, New York 16

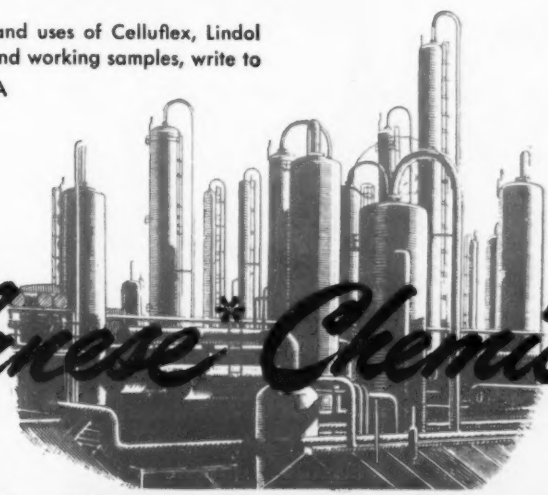
CELANESE* ORGANIC CHEMICALS NOW IN PRODUCTION·

Formaldehyde	n-Propyl Alcohol
Acetaldehyde	Isopropyl Alcohol
Acetic Acid	Butyl Alcohols
Methanol	Methylal
Acetone	Special Solvents

Tricresyl Phosphates

FOR LABORATORY EVALUATION, SCHEDULED FOR FUTURE PRODUCTION:

2-Methyl-1, 3-Pentanediol
Propionaldehyde



Celanese* Chemicals

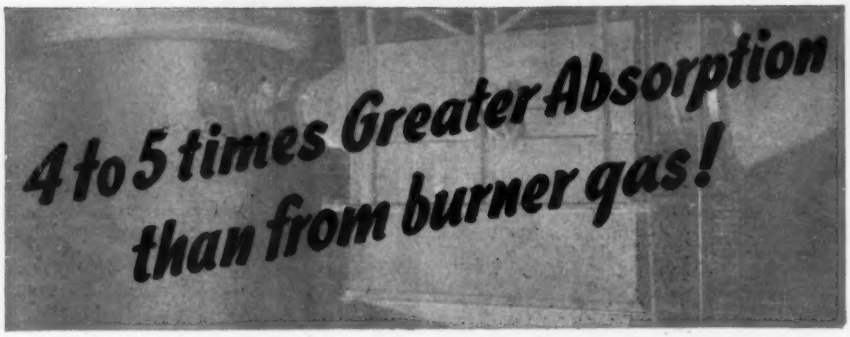
*Reg. U. S. Pat. Off.

ALCOHOLS • ALDEHYDES • GLYCOLS • KETONES • ORGANIC ACIDS • SOLVENTS • PLASTICIZERS • INTERMEDIATES

GET *maximum absorption*

OF SULFUR DIOXIDE IN WATER WITH

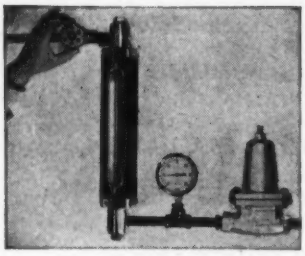
ANSUL SO_2



EQUILIBRIUM SOLUBILITY OF SO_2 IN WATER AT ONE ATMOSPHERE (Saturated Solution)

Temp. F.	% SO_2 by Weight in Solution			
	From Ansul Liquid SO_2	From Burner Gas Containing:		
		20% SO_2	18% SO_2	16% SO_2
32	18.59%	4.61%	4.15%	3.68%
50.6	13.95%	3.25%	2.93%	2.60%
68	10.14%	2.27%	2.02%	1.82%
77	8.60%	1.89%	1.70%	1.51%
86	7.30%	1.58%	1.42%	1.26%

It's So Easy to Install This Ansul SO_2 System and Get These Proved Advantages:



GREATER SOLUBILITY—As indicated in the table, much more concentrated water solutions of SO_2 may be obtained from 99.9+% Ansul Liquid SO_2 than from the most efficiently produced burner gas.*

HIGHER PURITY—Elimination of impurities inherent in burner gas (Ansul Liquid SO_2 is 99.9+% [by weight] PURE).

FINGER-TIP CONTROL—Easy, positive, finger-tip control providing extreme accuracy for reaction or adjustment of pH.

GREATER ECONOMY—Small investment in equipment, materially reduced operating and maintenance costs, and freeing of valuable floor space.

*This follows the principle described in Henry's law that the concentration of a dissolved gas in solution is in direct proportion to the concentration in the free space above the liquid.

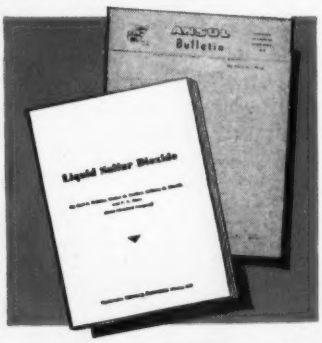
WRITE THE ANSUL TECHNICAL STAFF FOR FURTHER INFORMATION

LIQUID Sulfur Dioxide BY ANSUL

PHYSICAL PROPERTIES

Chemical formula	SO_2
Molecular weight	64.06
Color (gas and liquid)	Colorless
Odor	Characteristic, pungent
Melting point	−103.9° F. (−75.5° C.)
Boiling point	14.0° F. (−10.0° C.)
Density of liquid at 80° F.	(85.03 lbs. per cu. ft.)
Specific gravity at 80° F.	1.363
Density of gas at 0° C. and 760 mm	2.9267 grams per liter (0.1827 lb. per cu. ft.)
Critical temperature	314.82° F. (157.12° C.)
Critical pressure	1141.5 lbs. per sq. in. abs.
Solubility	Soluble in water
Purity	99.9+% (by wt.) SO_2 (H_2O less than 0.01%)

*REG. U. S. PAT. OFF.



Send for Bulletin 020.1, "A Comparison of Ansul SO_2 and Sulfur Burner Gas," and also for your copy of "Liquid Sulfur Dioxide"—a treatise on the properties, characteristics, and industrial uses of Liquid Sulfur Dioxide—written by the Ansul Technical Staff. *WRITE Dept. C.*

Also Manufacturers of Methyl Chloride

ANSUL CHEMICAL COMPANY
INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WIS.
60 E. 42nd St., New York — 535 Chestnut St., Philadelphia

gredient and as a translucent, smooth, non-congealing thickener for cosmetic creams and lotions. Finishes with excellent stiffness, uniformity, and feel are obtained when using the Clear Flo starches for laundry starching.

Other possible uses suggested for the Clear Flo starches as thickening, binding, or dispersing agents are in textile finishing and sizing, in cleaning compounds, water colors and paints, wall paper and poster pastes, in the dispersion of pigments for wet grinding, and in boiler feed water to prevent scale formation. The similarity of many of the properties of the Clear Flo starches to those of carboxymethyl cellulose suggests many other uses.

Warp Size NP 676

A new type acetate and viscose warp size is made by Nopco Chemical Co. Known under the trade name Unisize this new polymer represents the most advanced development in warp sizing. It is a single, one-product size which acts as binder, softener, **penetrant,** lubricant, humectant and defoamer. One of its most outstanding advantages is that Unisize completely eliminates the need for auxiliary additives to the size.

Physically, Unisize is a free-flowing, non-sticky, granulation which, in appearance, is very much like light brown sugar. It is extremely soluble and dissolves readily in hot water with a simple stirring. No lumps and gelling occur to prevent even distribution of the size on the warp. Unisize creates a strong bond and forms a flexible and non-tacky film. Maximum filament protection is provided. Static is eliminated during slashing and weaving. A minimum of shedding occurs in the loom.

Resistant Paints NP 677

The Duramite line of chemically inert paints and coating materials is now being marketed on a nation-wide basis by Morton Chemical Co.

The Duramites are all easily applied solutions of chemically inert resins. Acids, alkalies and most corrosive materials have no effect on these products. The Duramites, however, represent a distinct advance over previous coatings offered for such uses in their superior adhesion and heat resistance. A special Duramite Primer promotes excellent adhesion to any clean surface and one group of these products has been engineered to withstand continuous exposure to operating temperatures as high as 350°F.

The complete line includes products for both high- and low-temperature processing, for maintenance painting in corrosive atmospheres, specially en-

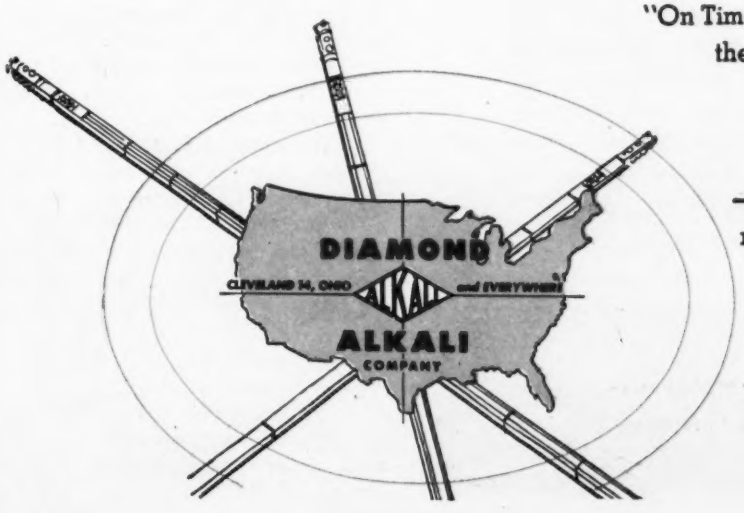
(Diamond Alkalies are "Behind the Scenes" of American Industry)

Dependable **Diamond**

Soda Ash

Helps Keep Trains Running Efficiently

Used as a water softener by America's Railroads



"On Time!" Those two words are mighty important in the successful operation of our great American railroads. They are the corner stones on which our world-famous transportation system has been built. Behind the scenes —dependable Diamond Soda Ash helps trains meet exacting schedules, as steam locomotives could not run efficiently without the soft water this Diamond product makes possible. This is one of the many examples where Diamond Alkalies are constantly serving American Industry.

this is a two-phase process...

WHAT'S YOURS?

Industry is full of others just as obvious—*so* obvious, in fact, that their two-phase nature is often overlooked. For instance, such widely diversified processes as metal cleaning, fire fighting, dispersing pigments and milling grain are just a few of the two-phase processes which bring together a solid and a liquid or 2 dissimilar liquids.

Rohm & Haas TRITONS—*surface active agents*—speed and simplify many of these processes. As emulsifiers, wetting or dispersing agents, their range of uses is almost infinite. In virtually *all* industries—paper, paints, printing inks, textiles, leather, rubber, metal, ceramics—you'll find TRITONS at work, reducing processing time, increasing efficiency, improving finished products.

If you're developing a new product, or want to improve the processing of an existing one, try the TRITONS. We offer a wide variety of these efficient surface active agents, and one of them may be the means of modifying *your* two-phase process favorably. Write us today, as fully as you wish. We'll be glad to discuss your specific processing problem and suggest a suitable TRITON.

TRITON *is a trade-mark—Reg. U. S. Pat. Off.*

ROHM & HAAS COMPANY

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Manufacturers of Chemicals including Plastics • Synthetic Insecticides • Fungicides • Enzymes • Detergents • Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and other industries.

gineered finishes for masonry and concrete, and chemical-resistant floor finishes. A variety of colors is available to both protect and identify equipment containing corrosive products. They are immediately available in 5-gallon cans and 50-gallon drums.

Additional distributorships, incidentally, are available.

Mold-Release Agent NP 678

A new lubricant and mold-release agent is now being used for molding water-dispersible powders into blocks, tablets and pellets.

The method is as follows: A 10% water dispersion of diglycol stearate S is made by warming to about 65°C and mixing for a few minutes until a uniform fluid is formed. About 5% of the latter fluid is added to the powdered material that is to be molded. The 10% dispersion of diglycol stearate S may be added directly to powders in water dispersion in concentrations of about ½% diglycol stearate S based on the dry powder. This is then dried, powdered, put into the molding machine and pressed cold.

The incorporation of diglycol stearate S in the molding powder permits faster ejection, prevents sticking, breaking and surface imperfections and adds to the cohesive strength of the molded product. Because of its surface-active properties it promotes better spreading of the finished product when it is wetted and applied to the final surface.

This process is applicable to molded detergent cakes, water-color tablets, colored pencil leads, white-shoe dressing cakes, cosmetic tablets, dye tablets, etc.

Diglycol stearate S is manufactured by Glyco Products Co., Inc.

General Purpose Varnish NP 679

A new insulating varnish designated as G-E general purpose varnish No. 9574 is being manufactured by General Electric. The new material can be used with practically all types of winding including enamel, cotton, asbestos, and glass covered wire.

A thermosettting, phenolic drying-oil varnish, it cures to a tough, pliable mass even in the deepest coils. It gives exceptional resistance to oil, acid, alkali, salt water, moisture, and heat, and is suitable for infra red baking. Possessing excellent aging properties, G-E 9574 has good build and flexibility, and imparts excellent dielectric strength.

The new varnish is especially easy to work and can be cured in conventional equipment at baking cycles as low as 212 F. It has a flash point of

HEYDEN
PARASEPTS®

NEUTRAL ESTERS OF PARAHYDROXYBENZOIC ACID

VERSATILE PRESERVATIVES

Heyden Parasepts are fine white powders possessing unusually effective preservative powers for products containing glues, mucilages, gums, fats, oils, carbohydrates and other materials subject to deterioration caused by fungus formation, mold growth, or yeast and bacterial action. The Parasepts are also used, under certain conditions, to promote antiseptic qualities in lotions, creams and powders.

In oil products, the Parasepts can be dissolved directly in the oil. In aqueous products, they are dissolved by heating or in alcohol. In powders, they are mixed dry. The sodium salts of the Parasepts are very soluble in water and are easily introduced into many products without using alcohol or heat.

Detailed technical information on how Parasepts apply to your particular process or product will be mailed promptly on request.

PUT THE PLUS IN YOUR PROCESS!

...Constant source of supply.
...Production control through uniformity.
...Exacting specifications ... assured quality.
...Extensive facilities of 5 modern plants.

PARASEPTS AVAILABLE

Heyden Parasepts are available commercially in five purified forms:

METHYL PARASEPT
(Methylparaben U.S.P. XIII)
ETHYL PARASEPT
PROPYL PARASEPT
(Propylparaben U.S.P. XIII)
BUTYL PARASEPT
BENZYL PARASEPT

Technical grades of the Parasepts are also available.

• • •

Heyden Parasepts are shipped in

5-LB. CARTONS
25-LB. FIBER DRUMS
100-LB. FIBER DRUMS

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CHICAGO OFFICE, 20 North Wacker Drive
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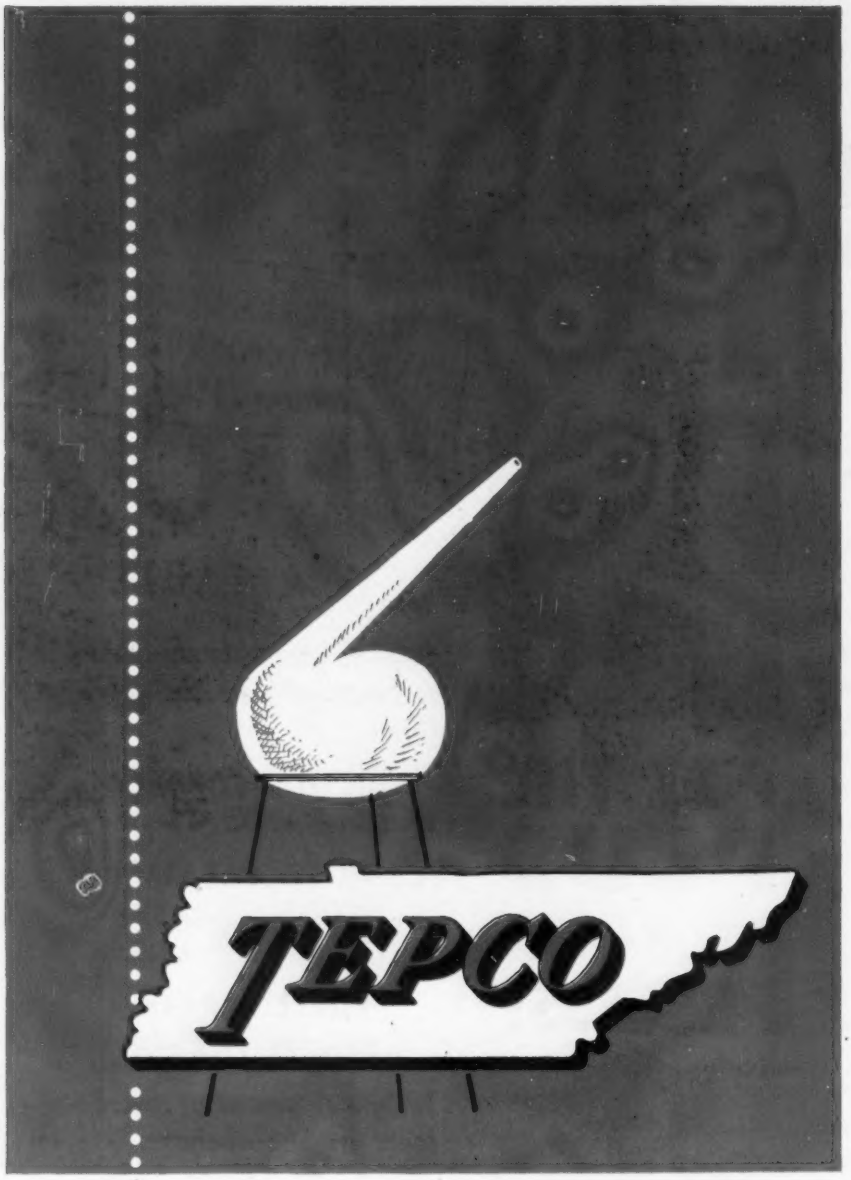

Sodium Benzoate U.S.P.

Absolutely of the highest purity, fine-flake Tepco Sodium Benzoate (U. S. P.) gives uniformly BETTER SOLUBILITY.

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Tennessee Products & Chemical Corp.

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100 F and its viscosity at 45 F is 600 C.P. average. The new insulation varnish can be used at barrel gravity or can be thinned up to 20 per cent with petroleum spirits or any other available commercial thinner.

Aluminum Enamel NP 680

A new synthetic heat-hardening low-gloss enamel, especially suited for factory-finishing of aluminum intended for outside exposure has just been developed by Sherwin-Williams' Industrial Division.

The finish is believed to have durability commensurate with any protective coating yet marketed for exterior use. The fact that it is spray-applied under ideal conditions and fast-baked provides a hardness equal to that of refrigerator finishes.

Sherwin-Williams' industrial engineers have perfected a special system for using the new finish. After proper surface preparation the aluminum may be roller coated with primer and baked, then fabricated and sprayed with the finish bake coat. Or, both the primer and finish coat may be applied after the metal has been fabricated.

Development of the new finish is seen as a practical answer for the objection of many consumers to raw aluminum finish on products for exterior use.

o-Chlorobenzotrifluoride NP 681

o-Chlorobenzotrifluoride (*o*-chlorotrifluoro methylbenzene) has recently been introduced in pilot plant quantities by the Hooker Electrochemical Co. The compound is of interest for its potential applications as an intermediate in the preparation of various chemicals and dyestuffs, as well as for possible use as a special solvent and dielectric fluid.

It is a colorless, aromatic liquid which is characterized by the CF_3 group. This radical is generally stable to light, heat and chemical reaction. Its distillation range is 150.9° to 152.4°C; freezing point is -7.4°C; and its specific gravity at 15.5°C is 1.379.

Masonry Coating NP 682

A new product, Aquaphane, perfected in the research laboratory of International Aquella Products, Inc., is an opaque water emulsion of a semi-plastic nature which, upon evaporation of the water, leaves a transparent coating on a masonry surface for its protection against the absorption of water and dampness.

The manufacturer claims it will revolutionize the painting, construction

What makes Baker's THIOCYANATES *so popular?*

HERE ARE ten reasons why Baker's Thiocyanates have proved so popular with pharmaceutical, textile dyeing, photographic, chemical process, and adhesive industries:

1. Each Baker Thiocyanate is an all-synthetic product.
2. Baker controls the basic raw material—both the quality and availability.
3. Baker's Thiocyanates are always white, with no discoloration due to raw material variation.
4. They contain no foreign sulfides.
5. Iron is kept to an extremely low level.
6. Baker's Thiocyanates contain no tarry residues because they are a synthetic product, not a recovery product.
7. Alkalies and alkaline earths are negligible.
8. Non-volatile matter is very low.
9. Heavy metals are extremely low.
10. Baker's Thiocyanates are produced in the form of regular needle crystals for ready solubility.

Baker makes a complete line of Thiocyanates: Ammonium Thiocyanate is available in C. P. Crystal, C. P. Special ACS, Purified Crystal and Technical Crystal. Calcium Thiocyanate is offered in two concentrations—Purified Liquid about 78% and about 45%. Potassium and Sodium Thiocyanates come in C. P. Crystal, N. F. Crystal and Technical Crystal.

Please write for test samples and prices.

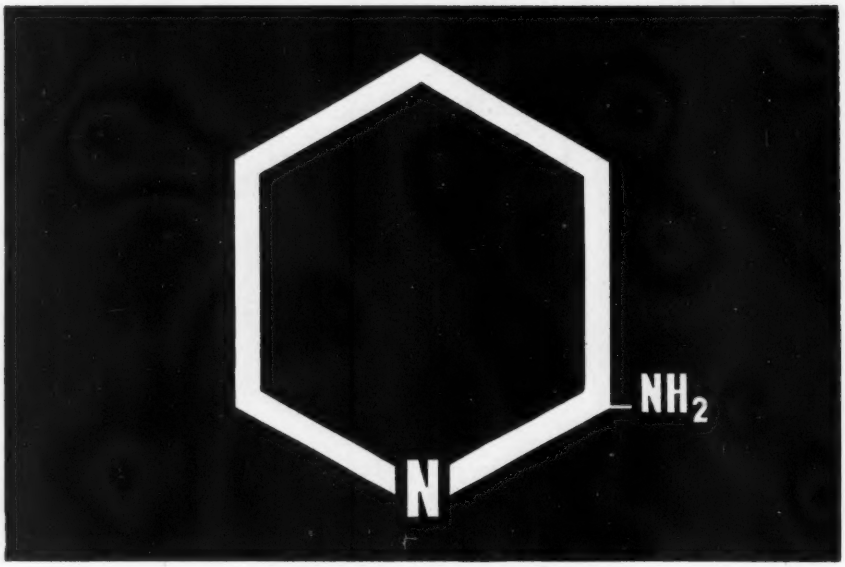
J. T. Baker Chemical Co., *Executive Offices and Plant:* Phillipsburg, N. J. *Branch Offices:* New York, Philadelphia, Boston and Chicago

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Reilly

2-Aminopyridine



AN ORGANIC CHEMICAL
OF CONSTANTLY INCREASING IMPORTANCE

One of the most interesting coal tar materials developed by Reilly during the past several years is 2-AMINOPYRIDINE, which is today recognized as an organic chemical of constantly increasing importance.

The use of 2-AMINOPYRIDINE in the manufacture of sulfapyridine is well known. Its more recent utilization in the manufacture of medicinals for alleviation of the distress of various allergies is important. A striking recent discovery is its ability to prevent the decay of citrus fruits.

Reilly COAL TAR PRODUCTS

In contrast to Pyridine, 2-AMINOPYRIDINE is readily sulfonated, nitrated, halogenated, mercurated or similarly processed, and is a unique starting material for the synthesis of pyridine compounds.

Other Reilly Aminopyridines include: 2-Amino-3-Methylpyridine, 2-Amino-4-Methylpyridine, 2-Amino-5-Methylpyridine, and 2-Amino-6-Methylpyridine. All of these materials are available in 95% purity.

REILLY TAR & CHEMICAL CORPORATION

MERCHANTS BANK BUILDING, INDIANAPOLIS 4, INDIANA

500 Fifth Ave., New York 18, N. Y. • 2513 S. Damen Ave., Chicago 8, Ill.

Reilly Coal Tar Chemicals For Industry

and masonry industry as far as preservation of original surfaces on monumental structures, buildings and private homes are concerned. It is not applicable to wood, metal, marble or other solid masonry work; but it is an excellent protective coating for porous masonry and common brick for the purpose of preventing the penetration of rain water into the walls.

It becomes thoroughly transparent after application. Aquaphane is stable as an emulsion at temperatures from 40 to 160 degrees Fahrenheit. The makers of Aquaphane recommend that it be stored in a normal temperature of 50 degrees or more. Application is exceptionally easy with an ordinary painter's brush. A gallon will cover an area from 150 to 225 square feet depending upon the condition of the building (or surface treated). For the second coat each gallon should cover up to twice that area.

Aquaphane offers four superior advantages in the field of transparent masonry surface coatings: It is non-inflammable, it is non-toxic and can be applied to either a moist or dry surface, and it will not peel or dust off, blister or bloom.

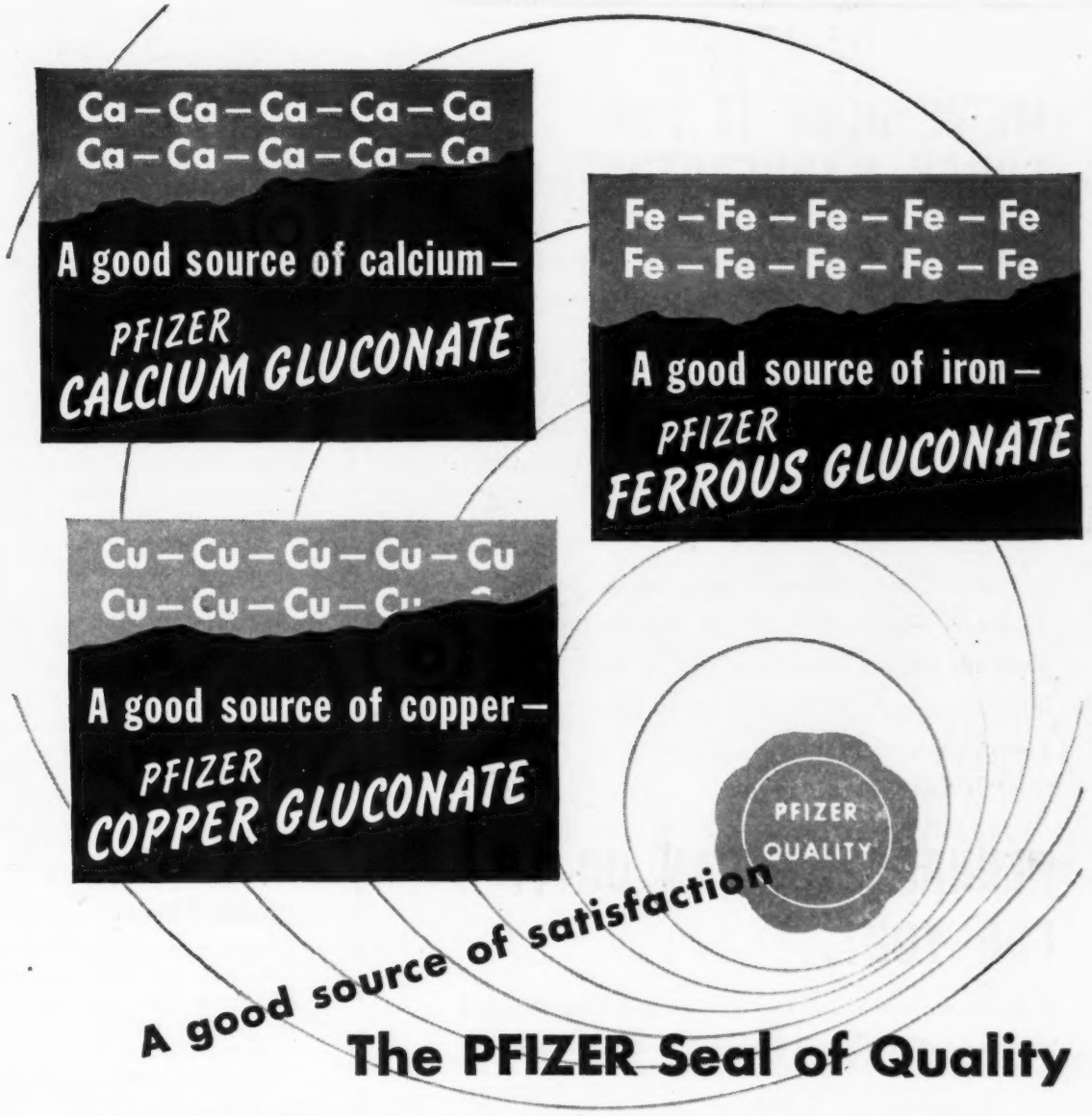
Foam Plastic NP 683

Plastic foam insulating material, that combines exceptionally low thermal conductivity with very light weight, is now being produced by United States Rubber Co. for low temperature installations.

Because of the insulating properties of the plastic foam, walls in installations can be made thinner, thus increasing storage capacity. Other advantages of the material, called U. S. Flotofoam, are that it is non-corrosive, non-toxic and self-extinguishing. It will not support mold or bacteria growth and holds its insulating value over a wide range of mean temperatures.

The snow white plastic foam is available in shredded or block form. The shredded form weighs from .8 to one pound a cubic foot, and the block form from .8 to 1.5 pounds a cubic foot. Blocks and slabs can be produced in a variety of sizes and shapes to fill cavities, and surfaced with paper, cloth or resin coatings. The shredded form, which is easy to pour and pack into irregular cavities, can also be supplied in individual containers, ready for installation.

The light weight and low thermal conductivity are obtained through the manufacturing process. Flotofoam is made from a combination of soluble resins, which are processed first into a liquid, then into a froth, jellied, permanently set and dried. Air bubbles, whipped in during the frothing proc-


Ca – Ca – Ca – Ca – Ca
Ca – Ca – Ca – Ca – Ca
A good source of calcium –
PFIZER
CALCIUM GLUCONATE
Fe – Fe – Fe – Fe – Fe
Fe – Fe – Fe – Fe – Fe
A good source of iron –
PFIZER
FERROUS GLUCONATE
Cu – Cu – Cu – Cu – Cu
Cu – Cu – Cu –
A good source of copper –
PFIZER
COPPER GLUCONATE
PFIZER QUALITY
A good source of satisfaction

The PFIZER Seal of Quality

Users of Pfizer Gluconates know the importance of *known quality* in a chemical. They realize that, in its operations, Chas. Pfizer & Co., Inc. combines the soundness of a long-established firm with the progressiveness of a constantly pioneering spirit.

From the company's biological research laboratories, for example, came the production of gluconic acid by a fermentative oxidation of glucose. And each of the salts of this acid reflect, in turn, benefits from the proper selection and control of manufacturing methods and procedures.

Other Pfizer Gluconates which may be of interest include Sodium Gluconate, Magnesium Gluconate, Manganese Gluconate, Acid Gluconic Technical, and Glucono-delta-Lactone. For further details on the present usefulness and potentials of Pfizer Gluconates, please address Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Avenue, Chicago 10, Illinois; 605 Third Street, San Francisco 7, California.

PFIZER QUALITY

PFIZER

Manufacturing Chemists Since 1849

6726

WE'VE DONE IT FOR SPRAY MANUFACTURERS...

MANUFACTURERS of household sprays, insecticides and disinfectants rely heavily upon aromatics to make their products acceptable to the purchaser for home use. In fact, no manufacturer would risk marketing such a product without employing some effective means of masking the odor of its basic ingredients. This problem of spray manufacturers has recurred so frequently in our laboratories that it is now just a matter of simple routine to prescribe the perfume or deodorant best suited to the job at hand. But all odor problems are not so easily solved. Indeed, many are highly complex . . . which makes us wonder: Is there a complex odor problem to be solved in *your* business? If there is . . .

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Perhaps we can show you how to rid your finished merchandise of residual odors detrimental to sales. . . . Perhaps we can introduce an appropriate fragrance that will give your product an appealing and competitive edge. . . . Perhaps we can destroy unpleasant odor conditions arising from manufacturing or processing operations in your plant, thus adding to the comfort and efficiency of your employees. On the chance that we *can* help you, why not drop us a line today? Describe your odor problem and let's see if we cannot correct it for you . . . *economically.*

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FACTORY: *Clifton, N. J.*

ess, are permanently trapped, so the finished material is over 99 per cent air and less than 1 per cent solid. The thermal conductivity or K value of the shredded form is 0.173 to 0.208 BTU/hr/ft²/°F./in. over a range of mean temperatures from 9°F. to 100°F. The thermal conductivity of the block form is from 0.20 to 0.23.

The material is also suitable for flotation purposes, for sound-proofing and for display and novelty uses.

β-Alanine NP 684

β-Alanine, an amino acid used by the pharmaceutical industry, is now made by B. F. Goodrich Chemical Co. Prepared in a high degree of purity by an entirely new process, this chemical intermediate will be sold as a raw material for the preparation of pantothenic acid, an ingredient used in conjunction with B-vitamins.

Initially, this use will consume the majority of β-alanine, but it is expected that new applications will be developed as a result of the potentially large volume and economies possible with the new method of manufacture.

The compound will be made in the new three million-dollar chemical plant to be built by B. F. Goodrich Chemical Co. at Avon Lake, Ohio.

Plastic Sheet NP 685

Production of Styron sheet stock developed for low cost transparent containers, has been established by the plastics division of the Willson Magazine Camera Co.

The sheet is made in thicknesses of 1/16", 3/32", 1/8" and 3/16". Because of greatly reduced initial tooling costs it is possible to supply this sheet at prices as low as 57 cents a square foot.

Styron is being used for parts and units in such fields as refrigeration, fluorescent lighting, display, aircraft, automotive, communications, and packaging. The sheet is immediately available in clear and opaque type in a wide range of colors.

Resin Finish For Cotton NP 686

The first wrinkle resistant finish which can be successfully applied to all types of cotton with little or no loss in tensile strength is claimed by American Cyanamid Company's Textile Resin Department. Even seersucker when treated with this finish remains fresh after several wearings.

The new finish, Superset, also controls shrinkage to 2 per cent or under. Wrinkle resistant finishes have been widely used for rayon fabrics but up to now only heavy constructions of cotton goods could be made wrinkle resis-

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Sodium Sulfite		**Photography; permanent wave solutions**

SULFITES

	FORMULA	TYPICAL ASSAYS*	CALCULATED SO_2 EQUIVALENT	FORM	SOLUBILITY In parts per 100 of water at room temperature
AMMONIUM SULFITE	$(NH_4)_2SO_3 + H_2O$	99% as $(NH_4)_2SO_3 + H_2O$	~47%	Small Granules	83
CALCIUM SULFITE	$CaSO_3 + 1\frac{1}{2}H_2O$	98% as $CaSO_3 + 1\frac{1}{2}H_2O$	43%	Crystalline Powder	0.004
POTASSIUM SULFITE	K_2SO_3	98% as K_2SO_3	40%	Coarse Crystalline Powder	184
POTASSIUM METABISULFITE	$K_2S_2O_5$	97% as $K_2S_2O_5$	51%	Granular or Powdered	49
SODIUM SULFITE	Na_2SO_3	99% as Na_2SO_3	50%	Small Granular Fine and Powder	30
SODIUM METABISULFITE	$Na_2S_2O_5$	98% as $Na_2S_2O_5$	61%	Granular or Powdered	67

*These figures are determined at the time of manufacture. Over long storage periods changes may be expected since some of these chemicals have a strong affinity for oxygen.

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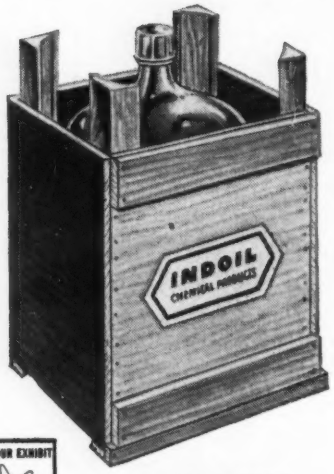

. . . are strong reactive acids, soluble in water and many organic solvents, and form metal salts, including those of barium and lead, which are characterized by high water solubility. They are of demonstrated interest in electroplating and are potentially applicable as catalysts or condensing agents in many reactions.

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tant because previously marketed types of finishes seriously weaken the fabric.

Melamine resin, modified in such a way that it does not affect the strength of the fabric, forms the basis of the new Superset finish.

Processing requires no special equipment other than the curing unit which is standard equipment in most cotton finishing plants. The new finish is available to all mills and finishing plants, and necessary resins and technical assistance will be supplied to interested mills by the American Cyanamid Co.

Hydrocarbon Solvents NP 687

Three new commercially pure hydrocarbon solvents have been made available for bulk shipment, by Esso Standard Oil Co. They are known as Esso Hexane, Esso Heptane, and Esso Octane. Manufacturers of protective coatings, rubber and vegetable oil extractions will be the principal beneficiaries of these improved products.

Advantages to be gained by use of these close-cut hydrocarbons include greater control in coating formulations; uniform evaporation rate from start to finish; improvement in odor; freedom from residual odor; less solvent retention by most resins, and greater flexibility for blending.

Sponge Rubber Curing Process NP 688

Sponge rubber which is extremely tacky before curing is generally cured by placing the uncured sheets on cotton duck liners which act as mold media. The cotton duck liners are usually paraffin treated to make them waterproof and to aid in anti-blocking. As an added anti-blocking aid powdered materials such as mica or clay are dusted on the duck or the rubber. These liners give very poor service since the paraffin melts out of the cloth during curing. Dusting gives the disadvantages of the dust problem, uneven coverage and undependable anti-blocking.

Cotton duck liners can be impregnated with Acrawax C Dispersion S-933 (manufactured by Glyco Products Co., Inc.,) to give a semi-permanent mold medium which may be used over and over again. The anti-blocking properties are excellent and no dusting is required. The cotton duck is run through undiluted Dispersion S-933 and then through a squeeze roll. The moisture is driven off and the wax set in the cloth by passing through heated calendar rolls. The pick up of the wax by the cloth is about 5-6 ozs. per sq. yd.

Cloth treated as above may be used

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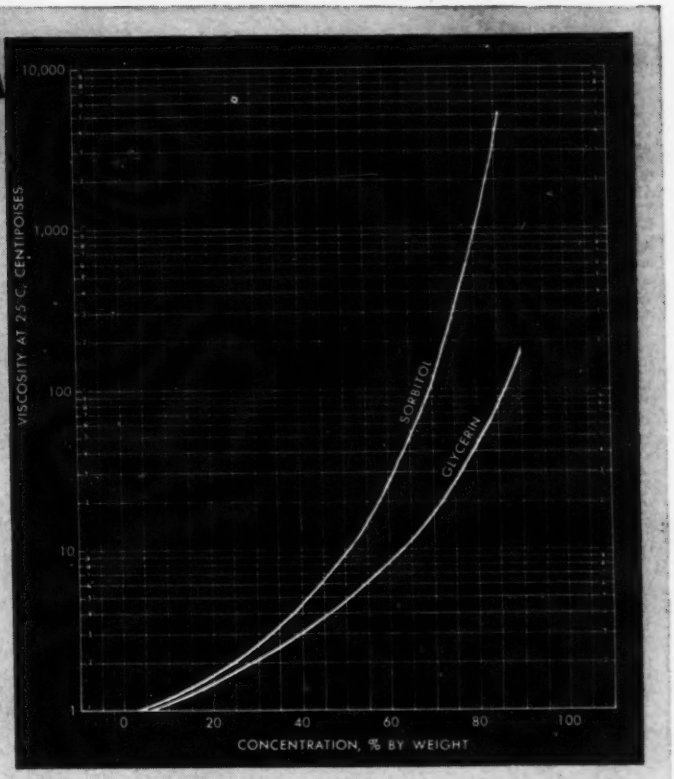

Sorbitol is a polyhydric alcohol with many unique properties which make it valuable in certain types of processing and synthesizing. Chart compares viscosity of sorbitol with glycerin at various concentrations.

SORBITOL
is much more Viscous

Sorbitol solutions are inherently much more viscous than the lower polyalcohols—even at high humidity. Conditioners of moderate viscosity and wide humectant range have a high moisture content at high humidities so that their viscosity is almost like water.

Materials conditioned with lower polyols are apt to be soggy or limp in damp atmospheres. Satisfactory low humidity properties can usually be attained with sorbitol solutions alone, although in some cases they can advantageously be combined with other less viscous conditioning agents.

Other characteristics that increase sorbitol's usefulness as a conditioning agent are its *narrow humectant range*, its slower rate of moisture change at various humidities, and the fact that it is *non-volatile*. Sorbitol is *compatible* with other materials normally encountered in conditioning problems. Its *chemical stability* keeps it from breaking down or decomposing in use.

Sorbitol is readily available in large quantities. Purity is the highest ever. Its price is not subject to wide variation and the trend is downward.

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an indefinite number of times while the cloth previously used will only give a fraction of the number of uses before discarding is necessary. The operation of dusting and the cost of the dusting materials is also eliminated.

Vitamin D Method NP 689

A new method of synthetically producing Vitamin D^3, covered by U.S. Patent No. 2,441,091, issued on May 4, 1948, has been developed by Philips Laboratories, Inc. The process uses relatively inexpensive materials and requires simple apparatus occupying a small space per unit of provitamin produced.

In the new method, the provitamin D,7-dehydrocholesterol, is produced by the bromination of a sterol, namely cholesterol, followed by the removal of elements of hydrobromic acid and the substitution of a double bond at the seven position of the sterol structure. The provitamin so obtained is then converted into the Vitamin D^3 by irradiation with ultra violet light.

Invented in 1942 in the Laboratories of the Philips Company in the Netherlands, the new process is being widely used both in this country and the Netherlands.

Quick Setters For Cement NP 690

Sika Chemical Corp. is manufacturing two new quick-setting compounds, Sika No. 2 and Sika 4A. These compounds are liquids that are mixed with cement. The initial set of the resulting mortar can be adjusted to be as low as 20 seconds and the final set as low as 30 seconds.

Using quick-setting Sika there is no need to excavate or otherwise relieve the water pressure. Even heavy pressure leaks are easily and effectively sealed on the exposed side.

Detergent Works With Oils NP 691

A new organic alkyl aryl organic detergent that forms clear solutions with oils or hydrocarbon solvents and imparts to these low-cost solvents soap-like properties has been developed by Curran Ordnance Chemical Laboratory.

Many commercial prospects exist for the new product since it may be added to low-cost hydrocarbon solvents such as diesel fuel or light fuel oil distillate, thus combining the high solvency of the benzines with soap and water detergency.

For example, it has been demonstrated in the field that the newly developed liquid concentrate may be add-

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a conjugated diolefin	METHYLPENTADIENE
a saturated trichloride	1,2,3-TRICHLOROPROPANE
a tertiary alcohol	TERTIARY BUTYL ALCOHOL
a tertiary olefin	DIISOBUTYLENE
a simple ketone	ACETONE

EXAMPLES

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ed to diesel fuel oil or kerosene in proportion of one part of the emulsifier base to one hundred of the petroleum distillate to form a highly effective liquid soap-like compound that may be used for washing buses, trucks and automobile bodies which have been heavily encrusted with mud and grease. The kerosene or diesel fuel solutions of the emulsifier may be simply sprayed over the painted surfaces and allowed to penetrate the heavy muddy accretions which may then be easily rinsed away by sluicing with a water hose—the dirt being removed in a safe oil-and-water emulsion.

Plastic Food Preservative NP692

The application of a combination of a thermoplastic resin with an odorless and tasteless preservative for coating fresh food in order to prevent spoilage from microorganisms has been announced by the West Atlantic Corp. The new product, an aqueous colloidal dispersion of preformed solid thermoplastic resin, combined with suitable preserving and wetting agents, is called Plast-O-Trete.

Shell eggs coated with this thin plastic film maintain their freshness without any refrigeration for as long as one year. Other perishables which can be processed in this manner are fruits, vegetables, copra, cocoabeans, and so forth.

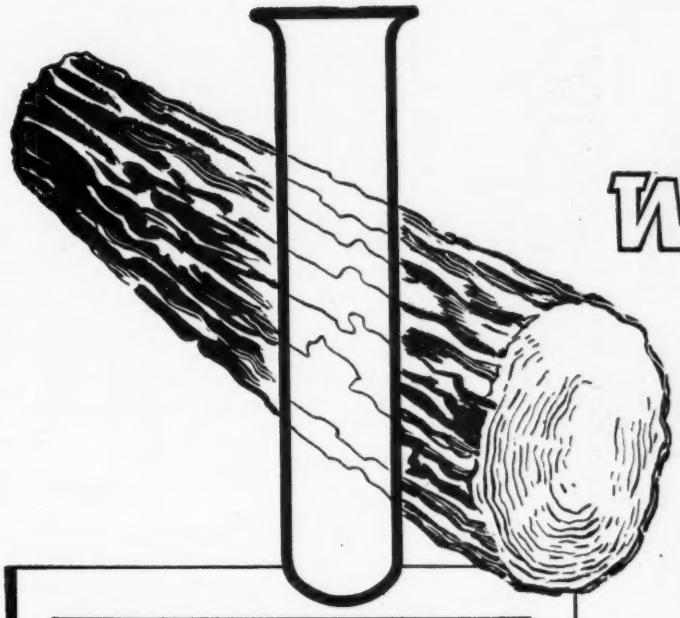
Lead Tetra-Acetate NP 693

Lead tetra-acetate is now being supplied by Arapahoe Chemicals, Inc., in the form of colorless to faintly pink crystals wet with glacial acetic acid. The product shows 85 to 95% active ingredient by iodimetric titration.

Lead tetra-acetate is a highly selective oxidizing agent best known for its property of splitting 1,2-glycols into two molecules of aldehyde. Alpha-hydroxy acids (5,6) are also oxidized and split by lead tetra-acetate in the same fashion.

The glycol-splitting type reaction may be carried out in a number of different solvent media such as glacial acetic acid, benzene, dichloroethane, and nitrobenzene. The reaction rates attained vary tremendously depending on steric factors but in general the velocity is much lower in glacial acetic acid than in other solvents. Even when acetic acid is used, however, the oxidation is sufficiently rapid and complete to allow the titration of many 1,2-glycols with N/10 $Pb(OAc)_4$.

While this reaction is ordinarily carried out in glacial acetic acid solution, it has been found that the addition of water or methyl alcohol to the acetic



What every Chemist should know about

INDULIN

(SULFATE LIGNIN)

Typical Analysis for Indulin A and Indulin C

TESTS (dry basis except moisture)	INDULIN A	INDULIN C
Moisture, %	4.3	8.3
Ash, %	0.4	19.1
pH	3.4	9.3
Methoxyl, % CH_3O	13.9	11.5
Sulphur, %	1.4	1.8
Apparent Density, lbs. per cubic foot	25.0	25.0
Specific gravity	1.3	1.3

INDULIN should prove of interest to those investigators who have been waiting for uniform grades of Lignin that assure close specifications in properties.

INDULIN "A" and INDULIN "C" are brown, free-flowing, amorphous powders of small particle size which are shipped in fiber drums. They are now available in tonnage quantities from our Charleston, S.C. plant.

Work done by our Development Department indicates that INDULIN has properties that either improve the product or make it less costly in such fields as rubber, printing ink, ceramics, paper, plastics and resins, detergents, storage batteries, asphalt emulsions, etc. If any of these applications suggests the use of INDULIN in one of your operations, write for further information.

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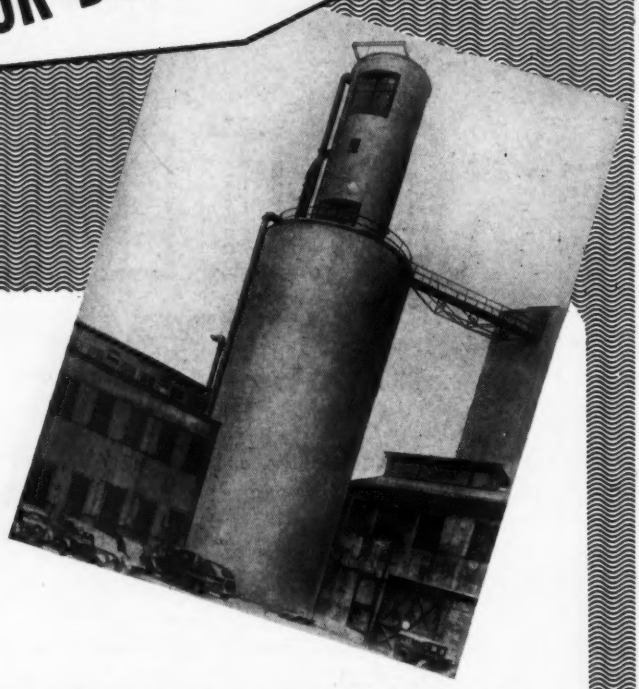

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acid increases the reaction enormously.

Lead tetra-acetate splits alpha-amino acids, 1,2-amino alcohols, and 1,2-diamines in a fashion analogous to its action on glycols and alpha-hydroxy acids. The product of cleavage at the NH_2-bearing carbon is an imine rather than an aldehyde. The imine is usually further dehydrogenated to the nitrile. However, if the NH_2 group is first protected (with p-toluene sulfonic acid, for example), the reaction can be stopped at the imine stage. Tertiary amino-alcohols are split in a different fashion to give the secondary amine.

Fluorescent Plexiglas NP 694

Signs with self-illuminating lettering, decorative panels with edges and surface designs that glow brilliantly under their own power, dials, pointers, and nameplates are some of the uses being made of a new fluorescent form of acrylic plastic just introduced by Rohm & Haas Co.

Called Daylight Fluorescent Plexiglas, the material has been described as having "built-in edge-lighting," since exposure of the plastic to daylight or normal room illumination results in edge-lighted effects ordinarily obtained by directing light into the edge of acrylic material.

The phenomenon is caused by millions of fluorescent dye particles with which the plastic is impregnated during manufacture. Each particle of dye, when struck by light rays entering the fluorescent sheet, reflects the light in all directions. Most of the reflected rays are trapped within the polished sheet and travel through it by repeated interior-surface reflections to the edges, where they escape in a high concentration of fluorescent light.

In addition to indoor signs, large individual block and script letters can be formed from the material. Shaped from fluorescent strips and mounted to present a single glowing edge to an observer, or formed from large sheets so that a double outline is in view, such letters have the appearance of lighted neon tubing. A background panel of clear transparent Plexiglas gives a striking suspended-in-air effect to such letters.

Daylight Fluorescent Plexiglas is shatter-resistant, light in weight, can be formed by methods applicable to standard acrylic sheeting, and is worked and machined like woods and soft metals. It is supplied at present in red and green colors, with other fluorescent hues being investigated by the manufacturer, in standard size sheets up to 36″ x 60″ and in thicknesses of .060″, .125″, .187″ and .250″.

ATLANTIC PETROLEUM CHEMICALS

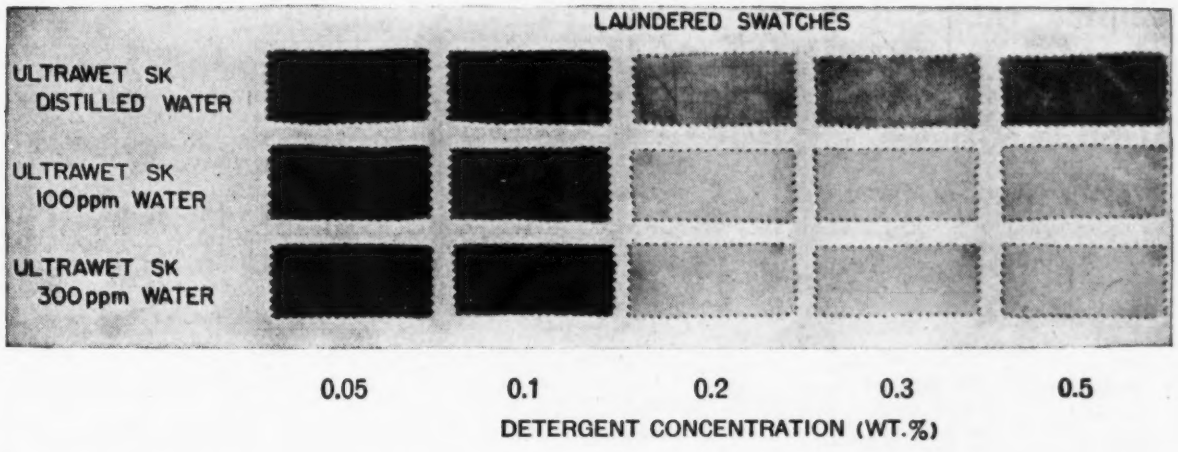
ULTRAWET K's

Is your detergent efficient in all kinds of water?

• If not, it will pay to investigate Atlantic's new Ultrawet SK. The efficiency of this improved detergent actually increases as water becomes harder. As shown below, Ultrawet SK is even more effective in water with a hardness of 300 ppm than in distilled water. *It eliminates the trouble and expense of water softening.*

• Ultrawet SK is one of the new K series of alkyl aryl surface-active agents. This family is the latest development of an organization that has been producing superior detergents and wetting agents for over 10 years. Ultrawet K's are backed by Atlantic's great research facilities. They are now available in quantity in the following types:

Physical form	*Wt. % Active Sulfonate—min.*
Ultrawet K (flakes)	**85**
Ultrawet 30K (liquid)	**25.5**
Ultrawet SK (beads)	**35**



Picture shows wool detergency of Ultrawet SK. Wool swatches impregnated with a synthetic soil are washed in a standard launderometer. The wash solutions consist of stated concentrations of detergent and water of type indicated. Tests are conducted for 20 minutes at 105° F., and followed by 2 rinses.

For samples, further information and quotations, contact

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Volume 62, January-June, 1948

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up to 45 tons per hour packed in thrifty multiwalls

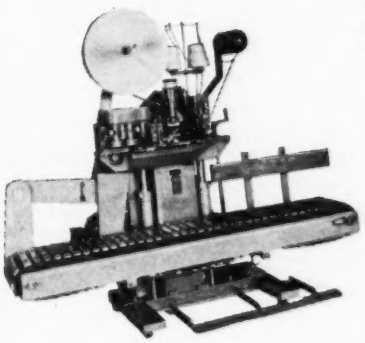
—contents sealed in!

Sealed is the word for it! Your chemicals can't sift out of multiwalls that are closed with Bagpakers.® No moisture gets in or out, and the closures are uniformly strong . . . proof against rough handling or dropping.

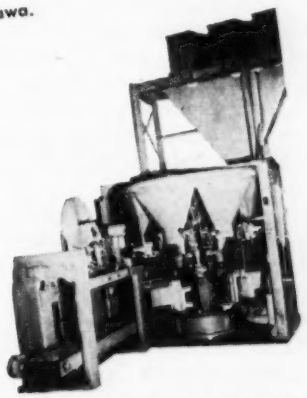
If you already have efficient filling and weighing equipment, check the "DA" Bagpaker for applying the famous "cushion-stitch" *taped* closure. Or where you want completely automatic operation, get the facts on Model "A". Used with free or semi free-flowing materials, the Model "A" is your central packing point . . . saves labor and give away weights . . . cuts bag costs. Bagpakers handle from 25 to 45 tons per hour—consistently. Talk it over with a nearby Bagpak engineer, or write for proposal.

INTERNATIONAL PAPER COMPANY, Bagpak Division, 220 East 42nd St., New York 17

Branch Offices: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kans., Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, Syracuse.
In Canada: Continental Paper Products, Ltd., Montreal, Ottawa.



MODEL "DA" (portable)—One operator, filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to BAGPAKER conveyor (quickly adjustable for various bag sizes). Starting and stopping of sewing operation is automatic, no tape wasted.



MODEL "A"—Completely automatic —extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine capable of filling and closing 100-lb. bags at the rate of 15 per minute . . . needs one operator.

BAGPAK DIVISION

NEW EQUIPMENT

Testing Welds with Supersonic Waves QB 521

Welds in ferrous and light metals can be inspected for lack of bond, inclusions or voids by employing high frequency sound waves generated by a

supersonic Reflectoscope, produced by Sperry Products, Inc.

The new development, angle beam transmission, allows entrance of the sound beam into the welded part at an angle. The searching unit, whose primary element is a quartz crystal, can be placed on the smooth parent metal adjacent to the weld, or even at some distance from it. The energy travels by successive reflections between the surfaces of the material until an interface is reached.

The weld metal does not constitute a reflecting interface, but voids or inclusions will reflect part of the sound beam back to the searching unit for amplification. This provides a vertical deflection of the horizontal trace on an oscilloscope screen. A time marking system determines the distance from the searching unit to the flaw.

With the Supersonic Reflectoscope smaller defects at greater depths can be located than with an x-ray or other non-destructive testing equipment. Also, by controlling the sensitivity of the instrument, defects or voids too small to affect the efficiency of the weld can be by-passed.

Self-Contained Dowtherm Heater and Cooler QB 522

Blaw-Knox Co. has started regular production of the first portable units of its self-contained Dowtherm heating and cooling system.

The system consists of one 100,000 Btu per hour Blaw-Knox electro-vapor generator; one 100 gal. Dowtherm surge tank; one 50 sq. ft. Dowtherm cooler; one cooling pump for circulation of the liquid Dowtherm; one complete charge of Dowtherm "A" heat transfer fluid; and instrumentation and framework complete with control panel.

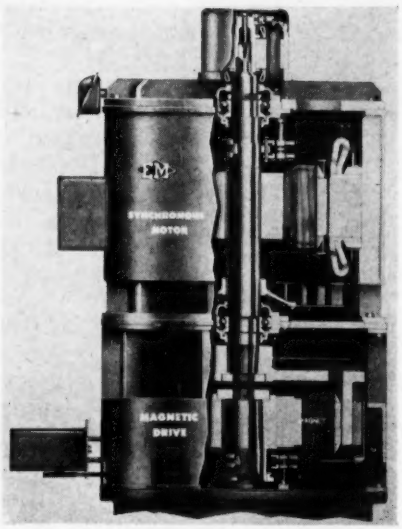
During the heating cycle, Dowtherm fluid is vaporized by the action of a 30 kw electric immersion heater. Design working pressure for the vapor generator is 60 psi.

While cooling is in progress, liquid Dowtherm is withdrawn from the lower outlet of the surge tank, forced by the cooling pump through the cooler, then through the customer's piping arrangement and vessel, jacket or coil, then back to the upper inlet fitting of the surge tank. The surge tank has capacity adequate to contain all of the Dowtherm fluid, permitting removal of fluid from other vessels, for inspection.

The entire unit is designed specially for Dowtherm heating and cooling service and is provided with the necessary fittings, auxiliaries, and controls. For applications where heating only is required, the company offers a 100,000 Btu per hour standard electrical vaporizer.

Synchronous Motor Magnetic Drive QB 523

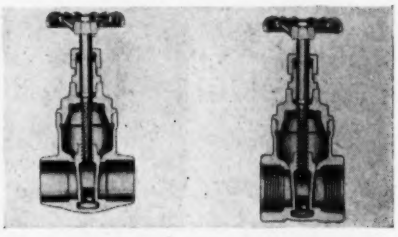
According to Electric Machinery Mfg. Co., their new vertical synchronous motor magnetic unit gives smooth adjustable speed control for centrifugal pumps. The motor drives the ring of the magnetic drive at constant speed



and the magnet member of the magnetic drive mounted on the gear shaft operates the pump at the speed required by use of liquid level control.

Gate Valves QB 524

Crane Co. has introduced a new line of 100-pound brass gate valves. They are furnished in two types, the No. 410 screwed-end valve, ¼" to 2", and the No. 1320 solder-joint valve, ⅜" to 2".



These are non-rising-stem valves and are intended to replace Crane No. 449½ and 1319, which are being discontinued.

The body design of the new valves incorporates features rarely found in low-pressure valves. The upper portion of the body is cylindrical in shape, similar to the design that has been used only in steel valves for the highest pressures, combining maximum strength with light weight. In addition to being ideal for resisting pressure, the cylindrical shape of the body

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (6-8)

Please send me more detailed information on the following new equipment:

QB 521	QB 524	QB 527	QB 530	QB 533	QB 537
QB 522	QB 525	QB 528	QB 531	QB 534	QB 538
QB 523	QB 526	QB 529	QB 532	QB 535	QB 539
				QB 536	QB 540

Name..... (Position).....
(Please print)

Company.....

Street.....

City..... Zone..... State.....

BEMIS MINUTE MOVIES

FOR SHIPPERS WHO WANT TO SAVE TIME AND MONEY

★ ★ ★

CEDRIC, THE CHEMICAL THAT WALKED IN HIS SLEEP

1. Cedric is a strange chemical . . . has the jitters . . . is hard to control.

2. Formerly he sifted about in storage . . . went sleep-walking and wasted his strength.

3. He needed better packaging . . . got it in a Bemis Waterproof Bag. Now he sleeps like a baby through long days and nights in storage.

4. And Cedric's rarin' to go when it's time for work.

Some chemicals sift out of ordinary containers and cause additional loss by damaging products nearby. They need the protection of Bemis Waterproof Laminated Textile Bags. These bags are extra sturdy . . . they resist tears and punctures. They are fully tested *before* they're put to work. *These pre-tests stop protests* . . . assure complete satisfaction.

Guard your products during shipment and keep them safe in storage with Bemis Waterproof Bags. Mail coupon now for prices and complete information.

BEMIS BRO. BAG CO.

Waterproof Department

Nation-wide Production and Sales

BEMIS Waterproof BAGS

BEMIS BRO. BAG CO.
408-J Pine Street, St. Louis 2, Missouri
Send details about Bemis Waterproof Bags for
_____ (Product)

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

reinforces the seats against the wedging action of the disc. This safeguards against distortion of the body when the valve is being seated.

The ends of the solder-joint design are made to fit closely over hard copper tubing. The close fit enables the solder to flow into the joint by capillary action. The joint is soldered by what is known as "end feeding", the solder being fed into the joint from the outer end of the socket.

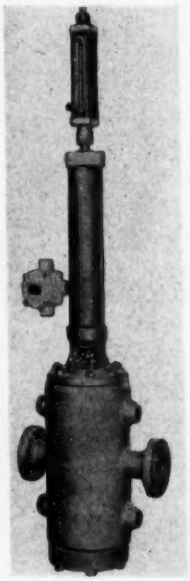
The disc is the one-piece wedge type and is guided by means of long guides which assure correct seating. Valve seats are cast as part of the body. The stuffing box is packed with molded asbestos, and can be repacked while under pressure when the valve is wide open.

Specific working recommendations allow the valves to be used with saturated steam at working pressures up to 100 psi and for water pressures up to 125 psi at 200°F. Precautions must be taken, for use at steam pressures and temperatures this high, to make up solder joints with high-melting-point solder.

Steam Jacketed Flow Meter QB 525

The Fischer & Porter Co. is now producing a new steam jacketed Flowrator (formerly Rotameter) instrument to measure flow rates of high melting materials such as molten sulphur, naphthalene and phosphorus.

Remote totalization, recording and control of the flow rate is available. Flow indication is also provided at the primary element. The meter indicating extension is furnished with steam heating coils and the entire meter body



is jacketed for 100 psi steam gauge pressure to insure that the material metered remains liquid in all parts of the instrument.

Hycar and Felt Sealing and Packing QB 526

Felt, in combination with Hycar latex and Hycar sheet stock, from the B. F. Goodrich Chemical Co., is being used by the American Felt Co. to produce mechanical sealing, packing and gasketing materials. Cut into strips and washers, these materials are marketed under the trade name Vistex and Oil Foil.

Vistex is a Hycar latex impregnated and laminated felt base packing and sealing material.

By controlling the ratio of felt fibre to the amount of Hycar impregnant, Vistex is made self-lubricating. In proper balance the Hycar latex saturation was so complete that positive sealing against dirt and moisture, dimensional stability, and excellent resistance to oils and fluids was maintained.

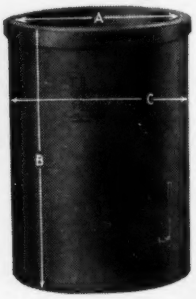
Present uses for Vistex include packing washers for fuel pumps, plunger seals, Vistex laminated faucet seals and gaskets, and seals and washers for all types of organic solvents, oils and fluids.

The Oil Foil seals combine in a single laminated bearing seal washer the conventional felt seal and one or more impervious septums of 1/64" or 1/32" Hycar sheet. These seals were originally developed to provide a grease and oil retaining washer in which the Hycar rubber would function

For Acid Storage and Mixing "U.S." CHEMICAL STONEWARE

JARS, POTS, TANKS

"U.S." Chemical Stoneware Pots, Crocks and Tanks are ruggedly built with extra heavy walls and bottoms to stand up under tough usage. The close-grained, nonporous body (made from specially selected and processed clays) does not absorb odors. The smooth, salt-glazed surface and well-rounded corners make cleaning easy.



CYLINDRICAL POTS

(without handles, but with or without covers or outlets, as desired) are made in 15 standard sizes with capacities ranging from 15 gallons to 500 gallons.

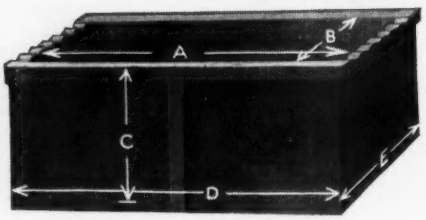
CYLINDRICAL POTS WITH HANDLES

(with or without covers or outlets, as desired) are made in seven standard sizes with capacities ranging from 2½ gallons to 30 gallons.

ACID AND CORROSION-RESISTANT ALL THE WAY THROUGH

All "U.S." Chemical Stoneware Pots, Crocks, and Tanks are available in either "standard" or "Ceratherm-500" heat-shock resistant bodies.

Write for your free copy of Bulletin 405 showing our complete line of chemical stoneware storage and mixing equipment.



RECTANGULAR TANKS

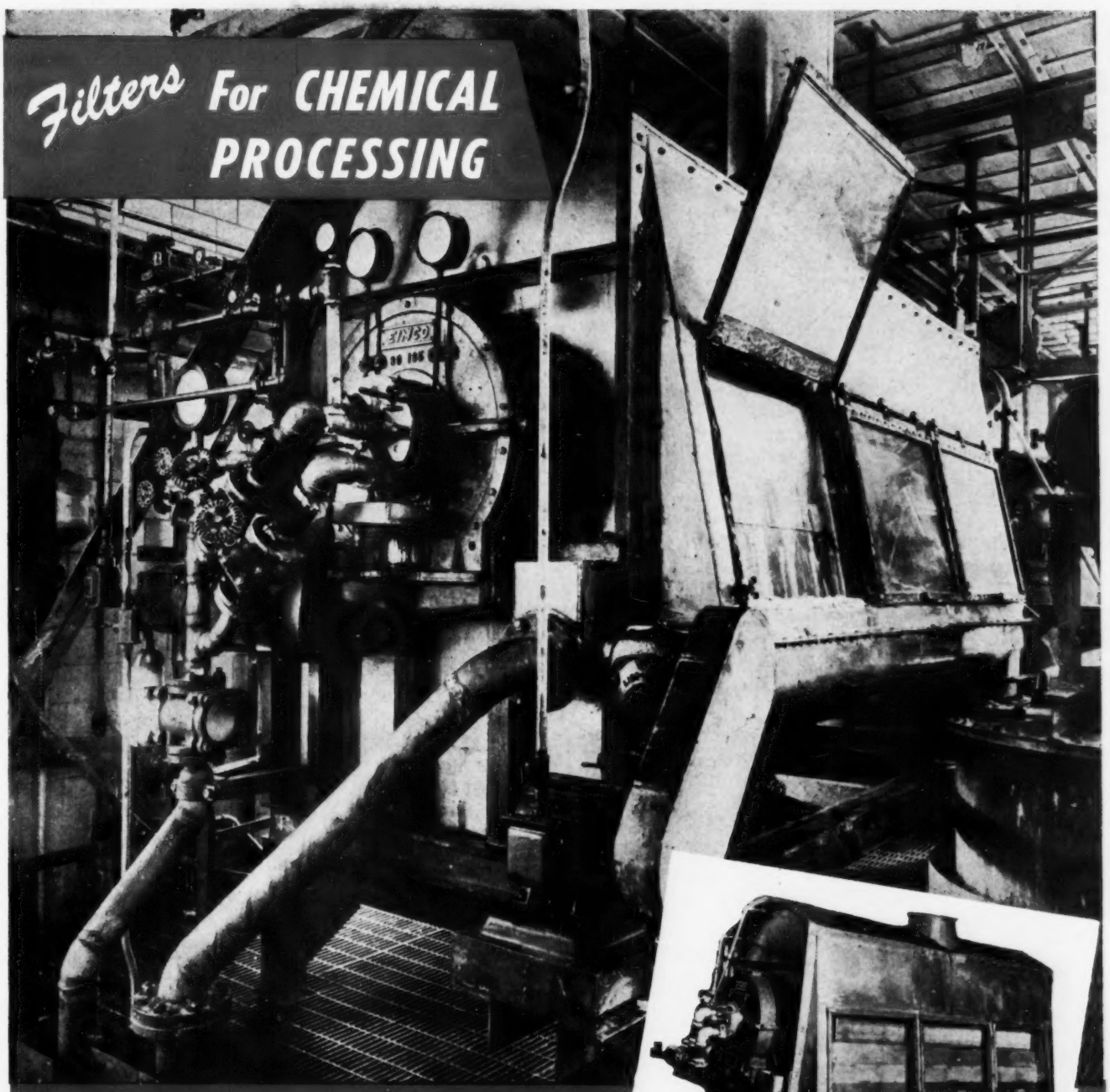
are manufactured in 14 standard sizes with capacities ranging from four gallons to 320 gallons with or without outlets.

422 A

U. S. STONEWARE

Akron 9, Ohio

Filters For CHEMICAL PROCESSING



Chemical Processing Plants require specialized Filtration equipment such as the equipment shown above. Eimco equipment is built to specifications and is designed to perform the difficult task of serving this specialized industry.

The 4' dia. x 8' face with vapor hood shown in the pictures is all stainless steel construction. Eimco craftsmen are also skilled in working monel, duriron, clad metals and other materials required for specialized work.

For the discriminating buyer, interested in good, sturdy, lifetime construction, workmanship of experts, and guaranteed performance, Eimco continuous vacum Filters assure satisfaction.

Eimco Stainless Steel Drum Type Continuous Vacuum Filter complete with vapor hood. Size 4' Diam. x 8' face, as furnished for installation above.

EIMCO

THE EIMCO CORPORATION

Executive Offices and Factories: Salt Lake City 8, Utah: Branches — 67 Wall St., New York 5 — 3319 So. Wallace St., Chicago 16 — Mills Bldg., El Paso — 1217 - 7th St., Sacramento 14 110 Malaga, Birmingham 9, Alabama

Foreign Branches — Hexham, Northumberland, England — 29 Rue de Mogador, Paris (9e), France — Manila, P. I.

A170

as a positive dam and seal against pressurized or low viscosity lubricants, but are now in demand for normal bearing seal applications.

Many types of Oil Foil washers can retain oil to the extent of more than 400% of their own weight, ready to bleed the oil to the point of friction if required. A Hycar septum on the outside surface of such a washer will prevent loss of lubricant to the outside and inside positive sealing against dirt and moisture.

Rotary Self-Supporting Pressure Joint QB 527

The Type-S, a new development of the Johnson rotary pressure joint, is designed to be self-supporting and requires no external piping support. It will be used to admit heating or cooling agents to rotating rolls, particularly where considerable lateral movement of rolls is encountered, or where supports can not be satisfactorily provided.

The new Type-S is completely self-lubricating, has no packing, and adjusts itself automatically for varying pressures. It has a spherical sealing surface which maintains an effective seal even though wear should occur at this point.

A large bearing or guide of graphite supports its entire weight. It is accurately fitted inside the body, where it provides a bearing surface on the rotating nipple. The seal is effected between a hemispherical collar on the nipple and another graphite bearing ring. Pressure itself is the sealing force—the higher the pressure the tighter the seal.

Four sizes are available—½", ¾", 1", and 1¼"—all suitable for 150 psi and 400°F.

Liquid Level Alarm QB 528

A new device to set off warning signals—bells, sirens or warning lights—when liquid levels in small boilers or various types of tanks reach predetermined low or high levels is available from The Reliance Gauge Column Co. The "Levalarm" can be used on pressures up to 250 psi. An electric switch is operated by a permanent magnet when a monel float rises or falls in a separate float chamber. The switch can be wired for a normally open or normally closed circuit—is dust, vapor and explosion-proof.

Corrosion Testing Device QB 529

A new instrument, the Pulse Polarizer, developed by Glenn A. Marsh, yields quantitative information on the extent to which metals polarize in given media for corrosion testing and may be used as a rapid means for obtaining the corrosion rate of metal. The Pulse Polarizer consists of a high voltage pulse circuit, sensitive electronic potentiometer, and high-speed recorder. It operates by subjecting a metal specimen to a brief but violent discharge and recording the polarization during and after this discharge. The data are reproducible, permanent, and distinctive for each set of corrosive conditions. Typical uses are in evaluating inhibitors, choosing proper corrosion-resistant alloys, determining corrosiveness of chemicals, and in controlling inhibitor concentration.

Glass Reinforced Rubber QB 530

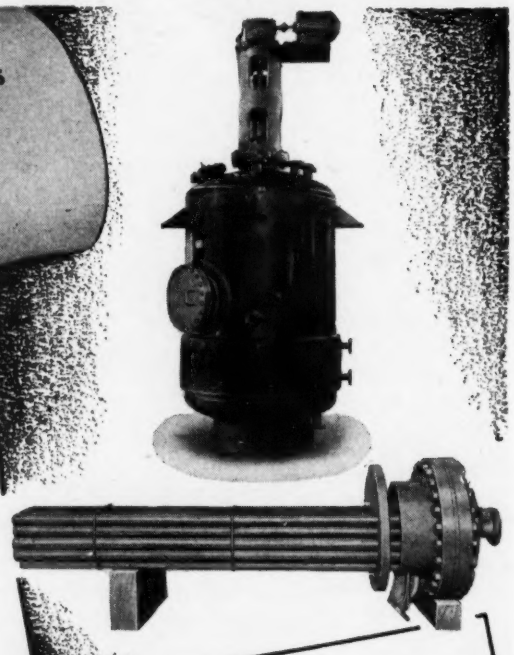
Hot materials conveyor belt, cushioned with rubber and strengthened with glass, is available from the Hewitt Rubber Div., Hewitt-Robins, Inc. Simultaneously, Hewitt noted a new glass-fiber acid-resistant rubber hose. Fiberglas fabric is used in producing the belting, while Fiberglas yarn is the reinforcing material in the hose.

The new hot materials conveyor belting will not char or lose strength from heat under 350° F., nor will it lose strength at the fasteners by heat burning out around bolts. It will not stretch for there is very little elonga-

PATTERSON-KELLEY
Heat Transfer EQUIPMENT

Stainless Steel
AS WE MAKE USE OF IT

★ KETTLES
★ HEAT EXCHANGERS
★ COOLERS
★ AUTOCLAVES
★ COOKERS
★ CONDENSERS

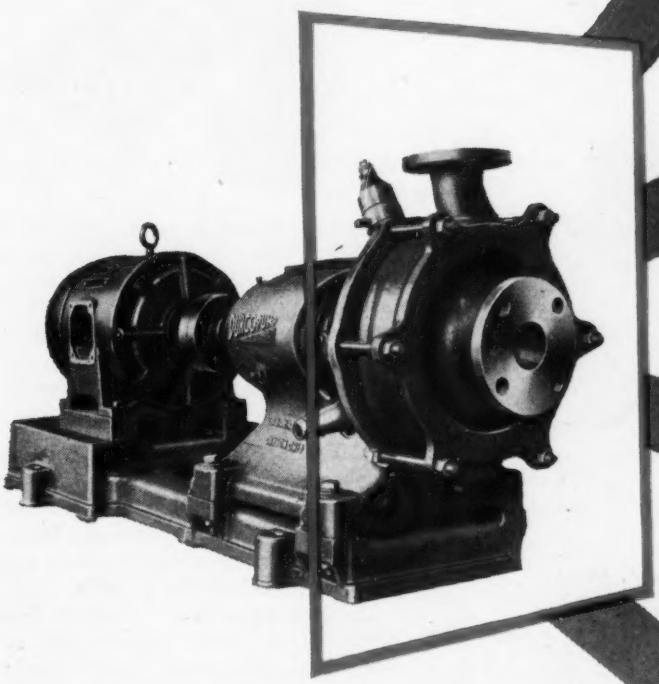


We have two experiences to offer in connection with your requirements along the above lines: (1) many years of experience in the design and construction of many types of heat transfer equipment; and (2) many years of experience in working with the stainless steels as used for such equipment.

Our engineers will be glad to work out the proper design of equipment to meet your requirements or help your engineering staff in any way if you prefer to do your own designing.

THE PATTERSON-KELLEY Company, Inc.
112 WARREN STREET, EAST STROUDSBURG, PA.
NEW YORK 17—101 Park Ave. PHILADELPHIA 3—1700 Walnut St.
CHICAGO 4—Railway Exch. Bldg. BOSTON 16—96-A Huntington Ave.
Representatives in Principal Cities

You can interchange this pump's CORROSION RESISTANCE to fit the corrosive



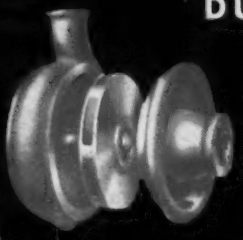
The wet end parts of this Model 40 Durcopump —casing, casing cover, impeller and shaft sleeve—can be easily changed from one corrosion-resisting alloy to another.

Without changing the operating characteristics or disturbing the motor, bearings or alignment, you can give your Durcopump the ability to handle an entirely new group of corrosives.

Model 40 Durcopumps are available in capacities up to 2000 GPM and for heads as high as 230 feet.

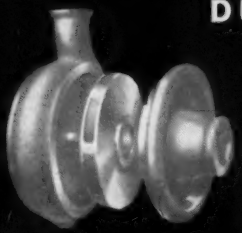
28-GM

DURIRON



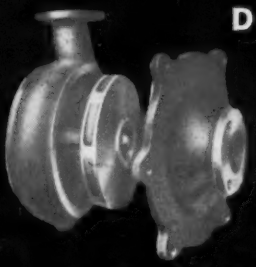
a high-silicon iron, containing approximately 14.5% silicon. Handles almost any commercial corrosive. Practically unaffected by sulfuric, nitric and acetic acid at any strength or temperature. Ask for bulletins 11 and 810.

DURICHLOR



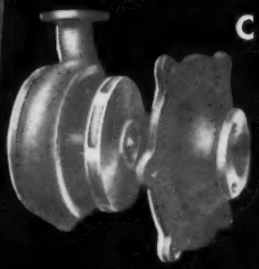
a high-silicon iron similar to Duriron but with much greater resistance to hydrochloric acid and its compounds, especially at higher temperatures and concentrations. Ask for bulletins 50 and 810.

DURIMET



a high nickel—high chromium—molybdenum—copper—silicon—low carbon stainless steel. Some of the corrosives it successfully handles include sulfuric and sulfurous acid, oleum, caustic and bleach solutions. Ask for bulletins 110-2 and 811.

CHLORIMET



#2—nickel base, high molybdenum alloy; #3—nickel base, high molybdenum, high chromium alloy. Both of these are high strength, machinable alloys. Chlorimet #2 handles hydrochloric acid in all concentrations and temperatures. It is excellent for hot sulfuric acid under reducing conditions and for wet hydrogen chloride gas. Chlorimet #3 handles most acids under oxidizing conditions, various salt solutions, also hot sulfuric in concentrations of less than 35%. Ask for bulletins 111 and 811.

OTHER ALLOYS

Durco D-10, Monel, Inconel, Pure Nickel, Ni-Resist and Nickel Cast Iron.

THE DURIRON COMPANY, Inc.

DAYTON 1, OHIO Branch Offices In Principal Cities

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

20th ANNIVERSARY

Greenwich Machine & Tool Company proudly announces that after 20 years of manufacturing and development of the Charlotte Colloid Mills, they have established

G. M. T. Colloid Mill Corp.

Exclusive Manufacturer and Distributor

CHARLOTTE COLLOID MILL

Send for Catalog C6

Standard Units from 1 to 75 H. P. with capacities up to 5000 gallons per hour.

INDUSTRIES SERVED

Adhesives
Paint & Pigments
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Paper
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Pharmaceuticals
Cosmetics
Plastics
Detergents
Polishes
Dyestuffs
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Rubber
Ink
Textile
Insecticides
Waterproofing
Oils & Greases
Wax Products

G. M. T. COLLOID MILL CORP.

30 Church Street New York 7, New York

tion in Fiberglas fabric. The plies are as strong as steel of equal weight.

● QB 531 A 5-gal. *rubber-coated perforated steel pail*, with rubber permanently welded through the perforations is now being manufactured by Automotive Rubber Co., Inc.

This utensil is designed for safer handling of acids and corrosive solu-

tions. It is shaped so that the top is no larger that that of the 3 gal. size to decrease likelihood of fluids splashing or spilling when carried. The handle is completely rubber covered. A pouring dip is formed on the edge and a tipping handle is provided at the base to make pouring easier and safer.

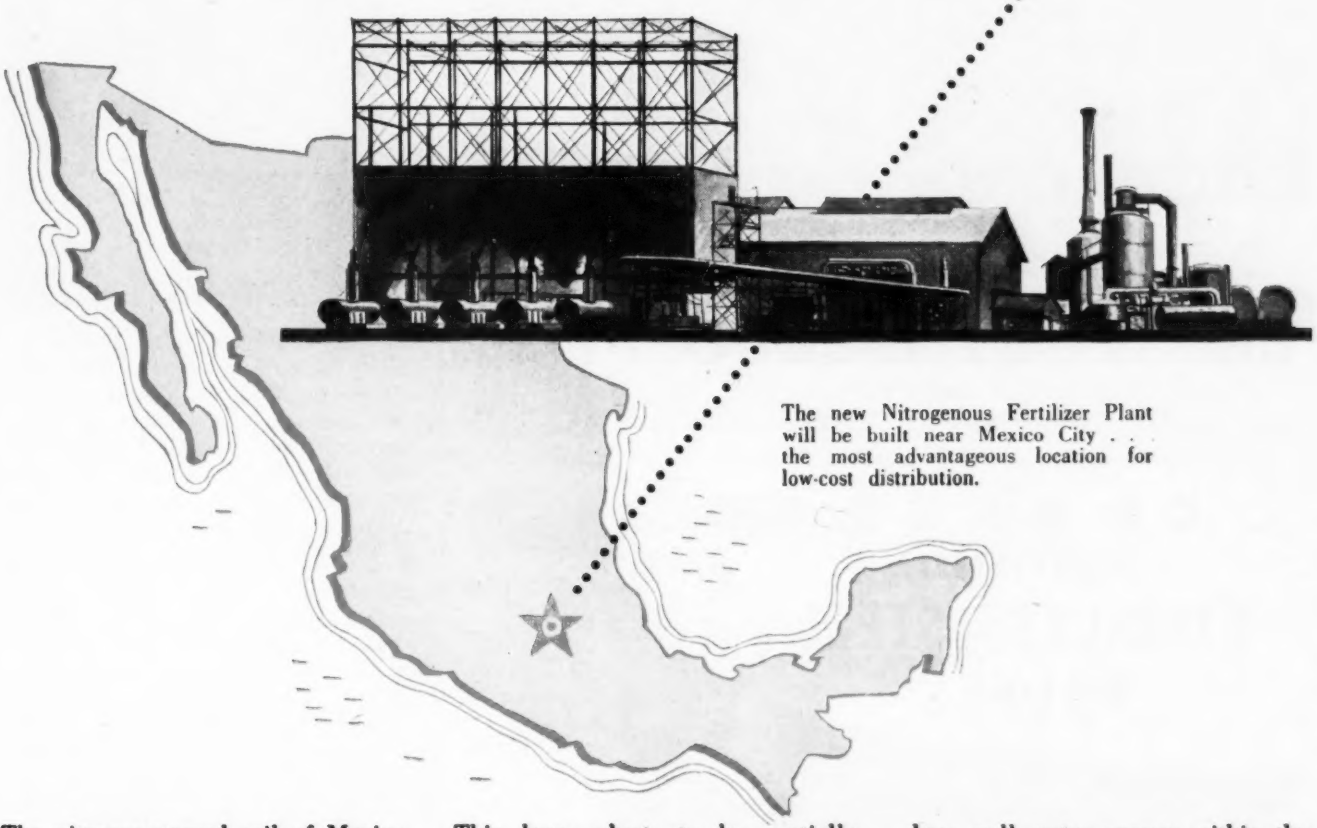
● QB 532 The separating medium employed in *cleaning coal* in the new Float-Sink process of the Link-Belt Co. is a mixture of water and finely-ground magnetite, proportioned to give the desired separating gravity.

It produces a clean "float" with a minimum of "sink" material or rejects in it; and a clean "sink" containing a minimum of "float" material. It is especially adapted for use where sharp separations must be made at a low specific gravity (1.25). It is also adapted to cases where the amount of impurities in the coal-feed fluctuates widely. It maintains its efficiency through such fluctuations without adjustment. It can handle coal above the usual 6 in. size.

● QB 533 Nylon fabric has been combined with rubber to make a new sheet material for *pressure regulator diaphragms* by the United States Rubber Co. The new material, replacing the conventional sheepskin and cotton duck, is said to have greater flexibility, lighter weight, higher bursting strength and improved sensitivity. It will be supplied in sheets 36 inches wide and $\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ inch thick.

● QB 534 The new Full-View *rotameter* with Safety Shielding for corrosive services of the Brooks Rotameter Co. has both the internal metal parts in contact with the fluid and all external metal parts made of stainless steel.

Nitrogenous Fertilizer for MEXICO



The new Nitrogenous Fertilizer Plant will be built near Mexico City . . . the most advantageous location for low-cost distribution.

The nitrogen-starved soil of Mexico will soon receive *70,000 tons of low-cost ammonium sulfate per year*, flowing in a steady stream from a new Chemico Fertilizer works now being designed. It will include *three* different, complete plants . . . a Synthetic Ammonia Unit, an outdoor type Contact Sulfuric Acid Plant, and an Ammonium Sulfate Plant. The basic raw material will be natural gas which formerly went to waste.

This huge plant, to be partially financed under a loan from the Export-Import Bank to National Financeria S. A., will be built for operation by Guanos y Fertilizantes S. A., the leading fertilizer manufacturer in Mexico. It will function continuously . . . and will be complete in every respect. It will include complete facilities for the production of power and process steam, electrical generating equipment, deep well water pumps within the works, and all general facilities.

Again . . . Chemico's knowledge and experience in this field has been utilized. In Egypt, India, Mexico . . . in strategic places the world over . . . plants designed and built by Chemico help meet the world's great need for fertilizer as well as for sulfuric acid, synthetic ammonia, methanol and other heavy chemicals.

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N. Y.

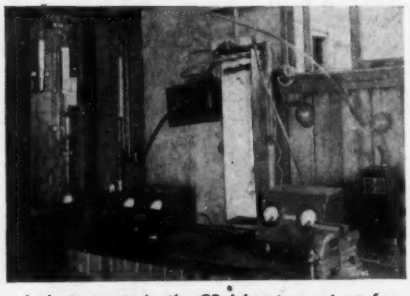
EUROPEAN TECHNICAL REPRESENTATIVE
CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND
EUROPEAN LICENSEE OF N. E. C. PROCESS
HYDRO-NITRO S. A., 8 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND
CABLES: CHEMICONST, NEW YORK

CC-172

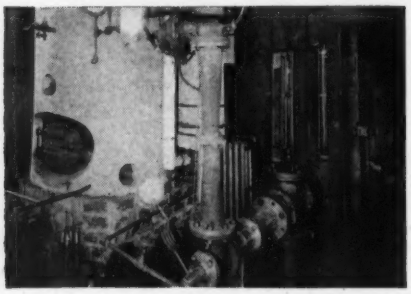
Chemico Plants are profitable investments

What's Behind a CR Evactor?

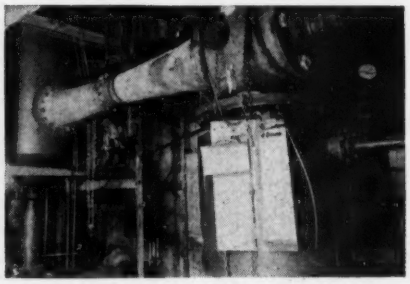
The production of Evactors is no routine operation at the Croll-Reynolds plant. Although CR engineers have over thirty years of industrial vacuum experience to guide them, the Croll-Reynolds testing and development department is one of the important units of the company. Development work is constantly under way to improve the efficiency of Croll-Reynolds Evactors wherever it is possible. It is this never-ending research and development which give CR Evactors their exceptional efficiency.



1. Instruments in the CR laboratory set up for measuring extremely high vacuum.



2. Special boiler in the CR pilot plant for providing unusual conditions of high pressure steam or superheat (or both) to duplicate the working conditions in customers' plants.



3. A 30-inch CR Booster Evactor on test in a CR shop.

CROLL-REYNOLDS CO.

17 JOHN STREET, NEW YORK 7, N. Y.

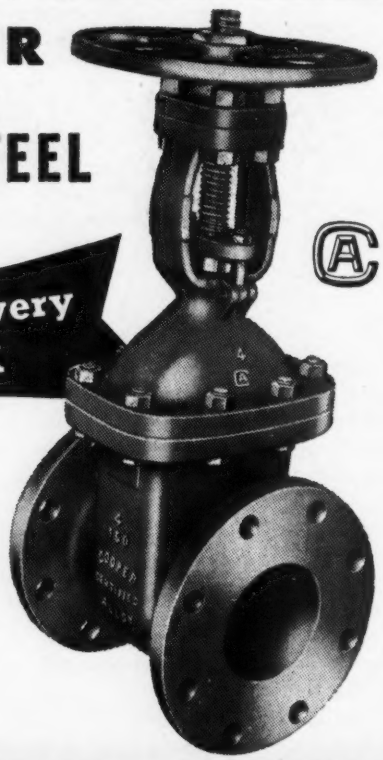
CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

CROLL-CR-REYNOLDS

COOPER

CERTIFIED

STAINLESS STEEL VALVES



Immediate Delivery from STOCK

COOPER can make immediate delivery from stock on Standard Type Stainless Steel Valves. These include: GATE • GLOBE • Y • NEEDLE • CHECK and QUICK-OPENING . . . also on Stainless Steel Pipe Fittings and Accessories.

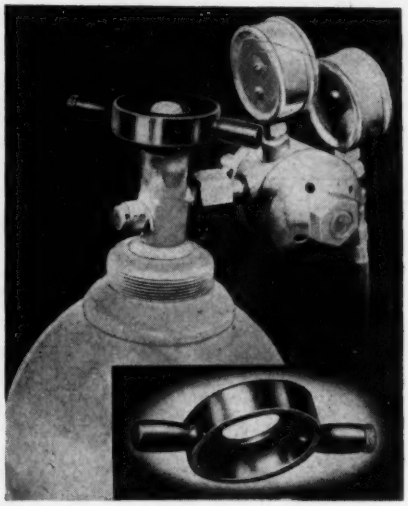
Specialists in Corrosion Resisting Stainless Steel

The COOPER ALLOY FOUNDRY CO.

HILLSIDE, NEW JERSEY

It is made with screwed connections in sizes ¼" to 1½" and with flanged connections in sizes 1" to 3". It will measure flow rates as high as 120 GPM of liquid or 240 CFM of gas.

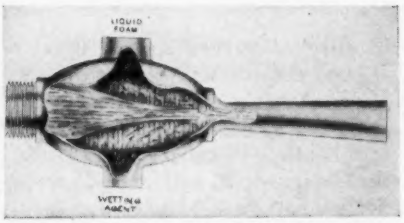
● QB 535 The "E-Z-Opener" is a one-piece casting which greatly facilitates the *opening of compressed gas cylinders*, according to Nutmeg Industries. It is readily fitted over the



standard cylinder valve handle and securely tightened in place by a knurled set screw. With this opener in place the main valve of the tank is easily turned without recourse to a wrench, and it is possible to close the valve much tighter with consequent elimination of gas leakage.

● QB 536 Aladdin Proportioners has introduced a single *mixing device* which automatically introduces either liquid foam or wetting agents into fire streams in the desired proportions without disassembling the equipment.

Proportioning at-the-pump, it allows complete freedom of movement



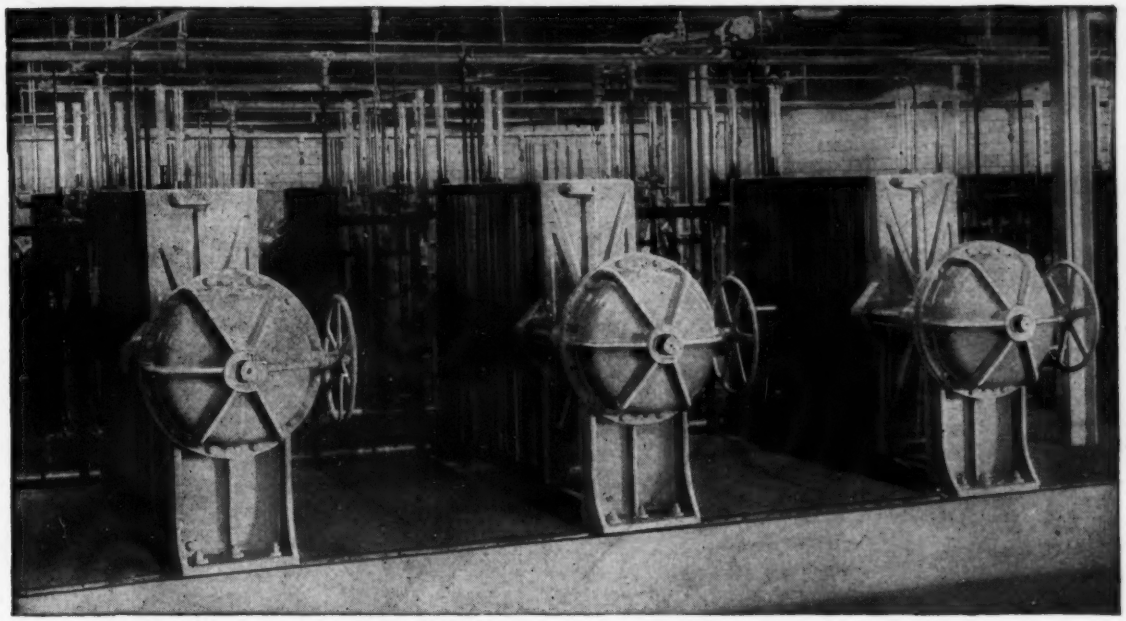
and ends cumbersome pre-mixing. Its operation gives fixed mixtures at 30 to 125 lbs. pressure with fog or straight stream. Aladdin, Model AA, which can be easily installed on present fire-fighting equipment, is designed for operation where pressure is maintained by a pump, with all nozzles on all size lines up to and including 1½".

●QB 537 A nylon-reinforced *V-belt* with twice the strength and four times the average life of conventional V-belts has been developed by United States

WEBCELL CONTINUOUS DIALYSER

May Be Your Answer to

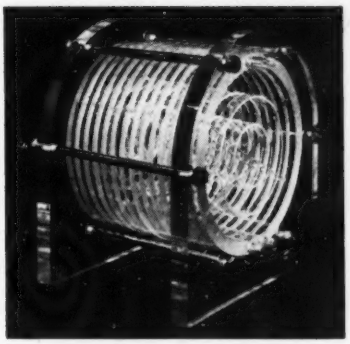
PROFIT *from* WASTE



One of several large batteries of Dialysers now being used in viscose rayon plants for the recovery of caustic soda.

Dialysis is now being used profitably in many fields for the:

- **RECOVERY OF ALKALIS**
- **REMOVAL OF ACIDS AND OTHER NON-WANTED MATERIALS**
- **PURIFICATION OF SOLUTIONS**
- **MANUFACTURE OF BY-PRODUCTS**



(Laboratory Model)
Made of Lucite

You may be throwing away material that can be turned to your profit through recovery or reuse as a salable by-product or you may wish to remove or purify your product.

The Laboratory Model Webcell Continuous Dialyser is currently being employed in the Research Laboratories of several chemical, food product, biological and pharmaceutical companies in this country and abroad. For those desiring to carry on experimental work in dialysis the Laboratory unit offers the opportunity to study the problem closely.

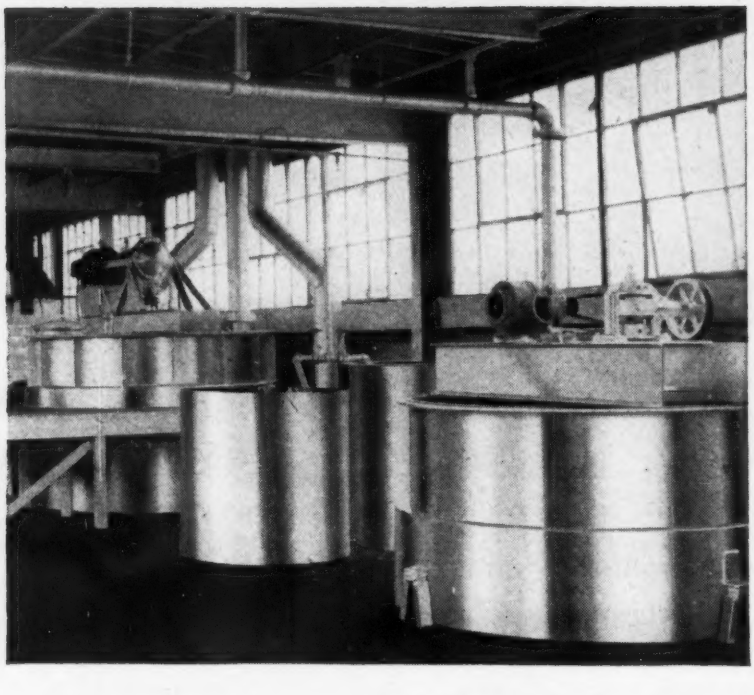
We suggest that you give consideration to this process as a means of greater efficiency and economy in your plant. Our experience with production equipment has given us valuable information which may be of interest to you toward the solution of your problem

BROSITES MACHINE COMPANY INC.

50 CHURCH STREET Cable Address—"Bromach" New York NEW YORK 7, N. Y.

Telephone—Digby 9-3600

PLAY SAFE
USE
Stainless Steel



BEING NON-CORROSIVE, *Stainless Steel* tanks and vats will permit colors to run true in successive runs, and allow the use of almost any dye or chemical by remaining unaffected through metallic contamination. Let *Stainless Steel's* strength, lower repair costs and longer life repay the initial costs and reduce the costly maintenance overhead.

***Truitt's engineering service* in the fabrication of carbon and stainless steel is available to the textile, chemical, pulp and other industries without charge. Whether your need be tanks, vats or other equipment, remember . . . *Truitt, one of the South's largest fabricators,* will gladly figure your job, without cost or obligation.**

TRUITT
MANUFACTURING COMPANY
• GREENSBORO, NORTH CAROLINA •

Fabricators of Solid Stainless Steel and Stainless-Clad Tanks • Dyeing Vats • Washing Tanks • Steam Drums • Storage Tanks for Acids and Alkalis • Mechanical Agitators • Separators • Stainless Steel Trucks • And Many Other Stainless Steel Products.

Rubber Co. The belt contains a series of tough nylon cords covered with a synthetic rubber compound capable of withstanding heat and oil.

The belt is particularly recommended for power transmission on equipment subject to rough usage. In addition to high tensile strength it has great flexibility and a sufficient amount of elasticity to absorb shock. The new belt will be distributed under the name of U. S. Royal Super Service V-Belt in fractional and multiple sizes.

• QB 538 Dependability and life have been greatly extended in the

flexible tubing of the Ronaflex Tubing Company, Inc. by the new buna and neoprene base synthetics. Some wire-braid Ronaflex has already served four times as long as those previously used and shows no sign of failure.

One-quarter inch tubing will stand burst pressures to 1000 psi. and larger sizes proportionally less. Installations for temperatures to 300° F are not uncommon.

Standard sizes from ¼" to 2" I.D. and in a complete range of lengths up to 200' in the small diameter and 50' in the largest diameters are supplied.

• QB 539 Material Movement Industries, Inc., announces that its lightweight Tote-All *bulk material conveyors* are now available with an adjustable chute that removes all stray iron from the bulk material being conveyed. The magnet is made of high-grade Alnico and is non-electric hence requires no wiring.

• QB 540 The Coolband is an efficient *perspiration retainer* designed by Mine Safety Appliances Co. to provide greater comfort on hot jobs.

Fitting comfortably all-around-the-head, the soft, sponge rubber Coolband constantly absorbs perspiration, creating a cooling effect and prevents perspiration from dropping into the eyes and on glasses or goggles.

EYES ON TOMORROW..

...for the complex *flow control needs* of Modern Industry

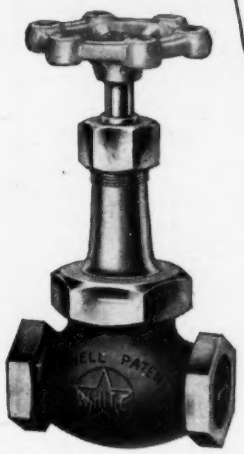


Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

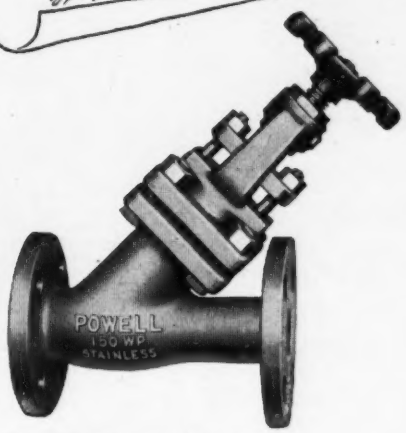


Fig. 2051—150-pound Stainless Steel "Y" Valve. Has flanged ends, bolted flanged yoke, outside screw rising stem and plug type disc.

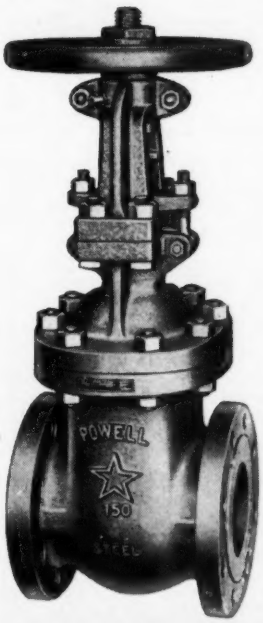


Fig. 1503 — Class 150-pound Cast Steel Gate Valve. Flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge.

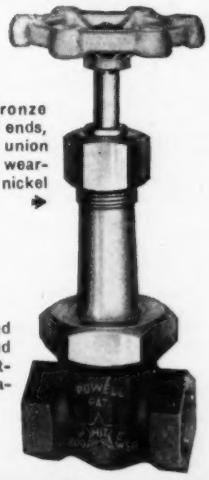


Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel bronze disc.

Throughout more than a hundred years of making valves, The Wm. Powell Company has continually had its "eyes on tomorrow"—anticipating the future flow control requirements of industry.

This foresight was responsible for Powell's introduction of the first regrinding globe valve back in 1865. The design on which the patent was granted is shown above.

Again, more than twenty years ago, Powell had a vision of the miracles to come in the chemical and process industries. The Powell Special Design and Alloy Valve division was established and ever since, as the demands have multiplied for valves to handle ever higher pressures and temperatures and a consistantly increasing variety of corrosive media, Powell has always been ready with the valves to satisfy them.

Today there's a Powell Valve for every industrial flow control requirement and, as new demands arise, Powell will be ready to meet them.

The Wm. Powell Company
Cincinnati 22, Ohio
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Adjustable Conveyor Belt Troughing Idler 624
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Alarm, Liquid Level 968
Anchor Base Expansion Joint Pipe Fittings 282
Apron, Heavy Duty Industrial 282
Ball Flow Indicator 98
Barrel Tilt and Drum 270
Batch Production Tunnel Kiln 96
Bearings, Gridded 268
Belt, Glass Fabric Conveyor 620
Booster Fans, Heavy Duty 100
Breathing Equipment, Self-Contained 790
Bucket Elevator, Duplex 786
Bulk Material Conveyor 974
Cells, Reference Conductivity 798
Changers, Multiple-Section Miniature Speed 790
Check Valve, Spring 270
Check Valve, Swing 792
Check Valves, Corrosion Resistant Swing 268
Chemical Feeder 786
Chemical Service Rotameter 614
Cleaner, Coal 970
CO Tester 272
CO_2 Recording Device, Thermal Conductivity 438
Coal Cleaner 970
Cold Process Water Conditioning, Rapid Reactor for 436
Condensate Return System 92
Conductivity Cells, Reference 798
Continuous Mixer 92
Continuous Viscosity Recorder for High Viscosity Fluids 270
Control, Programming 794
Controller, Stepless Temperature 440
Controllers, Solu Bridge 800
Controllers, Temperature 800
Conveyor Belt, Glass Fabric 620
Conveyor Belt Troughing Idler, Adjustable 624
Conveyor, Bulk Material 974
Conveyor Flights 434
Conveyor, Portable 624
Conveyor, Trough 92
Cooler, Dowtherm Heater and 964
Copper-Bearing Stainless Steel 796
Core Solder, Acid 788
Corrosion Proof Equipment, Graphite
Corrosion Resistant Swing Check Valves 268
Corrosion Testing Device 968
Coupling, Flexible 432
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Cylinder Opener, Gas 972
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Device, Thermal Conductivity CO_2 Recording 438
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Diaphragm Regulating Valves, Reversing Superstructure for 790
Diffusers, Porous Metal Filters and 272
Dowtherm Heater and Cooler 964
Drive, Synchronous Motor Magnetic 964
Drum and Barrel Tilt 270
Dry Chemical Fire Extinguisher 792
Duplex Bucket Elevator 786
Electrical Semi-Conductor 788
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Fans, Heavy Duty Booster 100
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Feeder, Heavy Duty Electric Vibratory Grizzly 794
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Filters and Diffusers, Porous Metal 272
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Flexible Tubing 974
Flights, Conveyor 434
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Flow Meter, Steam Jacketed 966
Flow Rate Indicator 614
Foamglas Pipe Insulation 614
Fork Lift Truck 282
Gage, Thickness 98
Galvanometer, High Sensitivity 784
Gas Cylinder Opener 972
Glass Reinforced Rubber 968
Gate Valve 436
Gate Valves 964
Gearless Pumps 102
Gearmotor, Vertical 440
Generator, Nitrogen 270
Glass Fabric Conveyor Belt 620
Goggle, Plastic, Safety 276
Goggles, Safety 96
Graphite Corrosion Proof Equipment 624
Gridded Bearings 268
Grizzly Feeder, Heavy Duty Electric Vibratory 794
Heater and Coller, Dowtherm 964
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Heavy Duty Booster Fans 100
Heavy Duty Electric Vibratory Grizzly Feeder 794
Heavy Duty Industrial Apron 282
High Intensity Magnetic Separator 784
High Lift Trucks, Hydraulic 282
High Sensitivity Galvanometer 784
Hopper, Self-Dumping 790
Hose Valve, Palm-Size 432
Humidifier 436
Hycar and Felt Sealing and Packing 966
Hydraulic High Lift Trucks 282
Idler, Adjustable Conveyor Belt Troughing 624
Immersion Heaters 784
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Indicator, Smoke 278
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Liquid Level Alarm 968
Magnetic Drive Synchronous Motor 964
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Magnetic Separator, High Intensity 784
Malleable Iron Socket Type Fittings, Threadless 278
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Meter, Air Velocity 790
Meter, Industrial pH 790
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Meter, Steam Jacketed Flow 966
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Mixer 972
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Offset Strainer 268
Packing, Hycar and Felt Sealing and
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Palm-Size Hose Valve 432
Perforated Steel Pail, Rubber-Coated 970
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pH Meter, Industrial 790
Pilot Plant, Electro-Vapor 94
Pilot Plant Rotary Vacuum Filter 620
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Pipe Insulation, Foamglas 614
Pipe Joint Compound 796
Plastic Safety Goggle 276
Plastic Tubing 268
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Porous Stainless Steel 102
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Pump, Metering 433
Pumps, Gearless 102
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Reactor, Agitated 790
Reactor for Cold Process Water Conditioning, Rapid 436
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Regulating Valve, Pressure Reducing and 794
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Rubber-Coated Perforated Steel Pail 970
Rubber, Glass Reinforced 968
Rubber Standing Mat, Sponge 798
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Swing Check Valve 792
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Temperature Controller, Stepless 440
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Troughing Idler, Adjustable Conveyor Belt 624
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Truck, Fork Lift 282
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Tubing, Plastic 268
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Valve, Palm-Size Hose 432
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Valve, Safety-Relief 274
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Vibratory Grizzly Feeder, Heavy Duty Electric 794
Viscosity Recorder for High Viscosity Fluids, Continuous 270
Water Conditioning, Rapid Reactor for Cold Process 436
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Wrench 790
Y-Type Strainer 798

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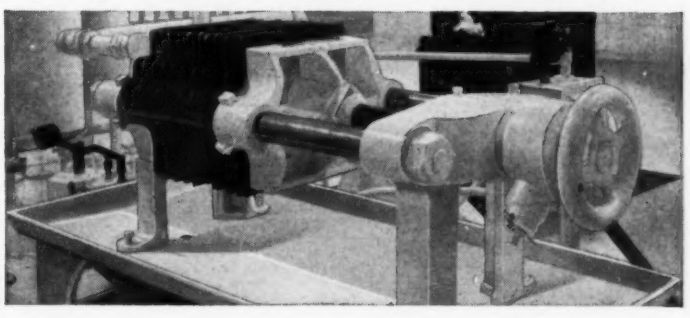
SPERRY FILTER PRESSES



PACKAGING & SHIPPING

by T. PAT CALLAHAN

Highlights of Cleveland Packaging Exposition

THE AMERICAN Management Association's 17th annual Packaging Exposition, held in Cleveland, Ohio during the latter part of April, drew about 2,000 manufacturers of packaging materials and machinery and packaged products. The Exposition itself attracted 13,800 packaging executives. The following discussions were of particular interest:

Lee R. Forker, general purchasing agent, Quaker State Oil Refining Corp. reported to the conference that barring unusual political or economic developments, paper, glass and textiles should be in good supply for packaging purposes during the rest of the year. The only cloud in this favorable picture, he said, is the steel situation, which was "bad to begin with and has been made worse by the recent coal strike."

Heavy-gauge steel drums, used extensively by the paint, chemical, and oil industries will be particularly short, he believes, especially since there is now no indication of any substantial reduction in demand.

Containers of other types, he said, will be fairly plentiful, and better quality wood and paper containers are being made. In the case of most types of containers, he added, no data is available to indicate any particular change in the price trend except a leveling off.

Just how important packaging is in the general sales picture was demonstrated by a case story of a label change which opened new outlets for the product in retail chains all over the country and doubled sales in outlets already distributing the product. M. Crawford Pollock, sales promotion manager, C. A. Swanson & Sons, Omaha, reported such sales increases for his company's canned products. He attributed additional sales appeal entirely to a new label because the products were exactly the same as before and prices were slightly higher.

Product Protection

S. L. Swenson, product engineer, Kimberly-Clark Corp., told the conferees that it is now possible for the packager to know in advance just how much cushioning material his product will require for a safe trip. It is only necessary, he said, to know the shock that will break the item in terms of "g's" or number of times the force of gravity, and the shock loads that will be imposed in transit. With this information, the manufacturer can refer to tabulated data (Report No. R-1627, "Application of the Properties of Cushioning Materials in the Design of Cushions" by K. Q. Kellicutt) of the Forest Products Laboratory, Madison, Wisconsin.

Among other new cushioning developments, Mr. Swenson mentioned lined bags, which are much like ordinary kraft or tissue bags except that the inner surfaces are laminated with creped cellulose wadding, felted cotton, or other cushioning material. Made in many shapes and sizes, they are finding widespread application in the silverware, plastics, and giftware fields.

Urge Careful Specifications

Harold F. Coleman, purchasing agent for the Rexall Drug Co., urged packagers to buy their materials and package parts from carefully drawn specifications. "It is amazing," he said, "to see how many companies have no specifications for the many parts that go into their packages. They depend entirely upon the knowledge and ingenuity of the suppliers to know what they want. But if, for example, closures are not properly made, complaints may come in that the product is developing a bad odor, or that there are particles floating in it. The loss of sales and good will which follows can never be recovered."

Urge Improvement in Export

Another front on which many packagers could improve their present methods, the sessions brought out, is export packaging. "If we Americans cannot, or will not, deliver the goods intact to our foreign customers," Walter H. Husted, assistant manager, Claims & Insurance, Isthmian Steamship Co., told the conference, "some foreign exporter will do it for us. Right now the competition may not be too great, because foreign countries are not able to produce enough goods, but the time will come."

Transportation conditions abroad are far from normal in many cases, even now, three years after the war, Mr. Husted pointed out. Some ports have modern piers and warehouses, he said, but others are still in process of repair after the ravages of war.

In some ports, he added, the ships do not dock at the pier but discharge the cargo into small open boats and then it is stored on open piers, often for weeks. In normal times, rail connections in Europe are good, but these are not normal times—the rolling stock of European railroads is worn out and is now in the process of being replaced.

Reduce Damage in Shipping

Measures being taken to improve the loss and damage record of American railroads—claims in 1947 amounted to $120 million—were reported on by A. L. Green, Association of American Railroads. Since the claims paid last year were equivalent to one-fourth of the net income of all the roads, Mr. Green said the roads are improving draft gears and springs for cars, dissemination of packaging data, tracks and roadbeds, mechanized handling equipment for stations, and education of employees in better handling methods.

Other speakers were E. H. Balkema, purchasing department, Colgate-Palmolive-Peet Co., who discussed package printing processes, and John D. Sheahan, Drake, Startzman, Sheahan, Barclay, Inc., who spoke on warehousing.

Mr. Balkema outlined the four major processes in printing packages: stencil, letterpress, planograph (Offset lithography) and intaglio (gravure). Each of these processes, he said, has advantages peculiar to itself, which may or may not be required when reproducing the artwork. Frequently more than one process can be used to obtain the same end result. By close and early cooperation between management, artist, and printer, a distributor can facilitate the selection of the process which will permit his package to say, "Take me home."

Sales Determine Warehousing

Mr. Sheahan pointed out that the first step in computing warehousing space requirements is to forecast sales. "Sales estimates should be related to the stock level for each item on the bills of materials and in the finished products line. Estimates should then be translated into cubic feet and net square feet of warehouse requirements, with consideration such building characteristics as ceiling heights and floor loads.

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average computation. Others require 90 to 120 days' stock. Production economy frequently dictates that a six months' to one year's supply of some items be manufactured at one time.

Claims Reduction

Through the efforts of its packaging methods group, Western Electric Co. has been able to cut its claim cost to less than .03 per cent of its sales, discussion at the Shipping Container Clinic, conducted by the company's experts, brought out. This record has been achieved despite the fact that many of the company's products are extremely fragile, and the items packed are of so many kinds that practically every type of packaging problem must be met.

W. R. Hummel, methods supervisor, who acted as moderator, gave the introductory talk. Various applications of different types of containers and interior packing material were explained by A. C. Beardsell, merchandise methods & results, who cited actual examples in the case of common types of containers and interior details.

ICC Regulations Amended

The Interstate Commerce Commission Regulations for the transportation of explosives and other dangerous articles were amended on April 19, 1948, and we quote the following changes of particular interest to the chemical industry:

To the list of explosives and other dangerous articles, section 4, was added a new poison classification: Poison D-Radioactive materials.

The following articles were added to the Regulations:

Article	Classed as	Exemptions and packing (See sec.)	Label required if not exempt	Maximum quantity in one outside container by rail express
(Add) Anhydrous hydrazine, See Hydrazine, anhydrous				
(Add) Hydrazine, anhydrous	Cor. L.	No exemption 276	White	5 pints
(Add) Hydrazine solution containing 50 percent or less of water	Cor. L.	No exemption 276	White	5 pints
(Add) Chlorine trifluoride	Cor. L.	No exemption 253A	White	25 pounds
(Add) Lithium metal, in cartridges	See Sec. 206 (d) (1)			
(Add) Lithium aluminum hydride, ethereal	Inf. L.	No exemption 110A	Red	1 quart

Section 103 (a) (Inflammable liquids, etc.) was amended to include lithium aluminum hydride, *ethereal.*

Section 103 (b) was amended to include lithium aluminum hydride, *ethereal.*

Section 110A was amended as follows:

(Add) 110A (a) Lithium Aluminum hydride, ethereal, must be packed in specification containers as follows:

(b) Spec. 6A, 6B, 6C, or 17H (single-trip).—Metal barrels or drums with not more than one inside glass container not exceeding 2 gallons capacity. The inside container must be completely cushioned in sufficient incombustible cushioning material to completely absorb the contents in event of breakage.

These above sections were amended in order to include this material as an inflammable liquid and also to prescribe specification containers.

Amending section 206, order August 16, 1940 as follows:

(Add) (d) (1) Lithium metal in cartridges, when packed and described as follows is exempt from specification packaging and labeling requirements.

(Add) (d) (2) In inside hermetically sealed metal cartridges not exceeding 18 grams net weight each, packed in strong outside containers. Net weight of lithium metal in any outside container, not over one pound.

Section 207 was amended to clarify the packing requirements for sodium sulfide as follows:

(Add) (e) Sodium sulfide containing 35 per cent or more combined water by weight, fused or concentrated but not ground (may be chipped, flaked, or broken) is exempt from specification packaging and labeling requirements, when packed in steel barrels or drums with closures treated to prevent the entrance of moisture in quantities sufficient to create a hazardous condition in transportation.

Section 245 was amended to include hydrazine, anhydrous, hydrazine solution containing 50 percent or less of water, and chlorine trifluoride. This was a necessary provision for material not heretofore shipped commercially.

Section 253A (a) was added and reads as follows:

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Chlorine trifluoride must be packed in specification containers as follows: (b) Specification 4B240 or 3A480.—Cylinders.

Section 276 (a) was added as follows:

(Add) 276 (a) Anhydrous hydrazine and hydrazine solution containing 50 per cent or less of water must be packed in specification containers as follows:

(b) Specification 1D.—Boxed glass carboys.

(c) Specifications 15A, 15B, 15C.—Wooden boxes with inside containers which must consist of glass bottles not exceeding 1-gallon capacity each, cushioned by means of vermiculite within tin cans which shall be tightly closed.

(d) Specification 5A, 5.—Metal drums which shall be of 304 or 347 stainless steel.

Section 303 (k) entitled *Restrictions for Gases* (named in table) has been amended by the inclusion of a new specification container, ICC 4BA. This container is now authorized for dichlorodifluoromethane; hydrogen sulfide; insecticides; liquefied gas (see note 8); liquefied non-inflammable gases; liquids other than those classified as inflammable, corrosive, or poisonous and mixtures or solutions thereof, charged with nitrogen, carbon dioxide, or air (see note 10); methyl chloride (see note 4); propylene; sulfur dioxide; vinyl methyl ether inhibited (see note 7).

Notes in connection with this table are not quoted. However, anyone interested may refer to the Regulations, section 303 (k).

Section 303 (p) (11) has been amended by the inclusion of the following:

and those made to comply with ICC-8 *paragraph 22*, need not be heat treated or tested, provided porous filling is found to be unchanged and intact.

Superseding and amending paragraph (q) (1) table, section 303 (*Compressed gases in tank cars and motor vehicles*), orders August 16, 1940, and November 8, 1941, to read as follows:

Name of gas	Maximum permitted filling density Note 1	Required type of tank car Note 2
	Percent	
Liquefied carbon dioxide	Note 10	Note 11. ICC-105A500; ICC-105A600
Liquefied petroleum gas (pressure not exceeding 75 pounds per square inch at 105° Fahr.)		Note 9. ICC-104A

Cancel Note 13, to paragraph (q) (1) table, section 303 (49 CFR, Parts 71-85, Cum. Suppl., p. 11922).

Cancel Authority granted for special specification for construction of portable fusion-welded steel tanks for test service for transportation of butane on board freight vessels, listed

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under "Appendix—Special Orders for Trial Containers" found in (Cum. Supp., p. 12115), and in orders of December 28, 1939 (Cum. Supp., p. 12123), and of March 29, 1940 (Cum. Supp., p. 12127); and also Report of the Commission dated December 28, 1939 (235 I.C.C. 595).

Section 325 (a) has been amended to include an additional classification for poisonous articles as follows: (e) Radioactive materials—Class D.

A new specification ICC 4BA has been approved. Products which may be shipped in this specification cylinder have been listed under section 303 (k).

Paragraph 8A, specification 3D (Welding or brazing authorized), has been amended as follows:

> 8A. Welding or brazing is authorized, but only for the sealing of neckrings which must be threaded on the external neck of cylinders of not over 500 cubic inches capacity. Cylinders and neckrings must be weldable steel, the carbon content of which must not exceed 0.25 per cent except that the use of 4130X steel is authorized. The weld free from moisture must be tested with gas or air at not less than 800 pounds per square inch.

Amending Specification 8 (*by adding paragraph 22*), order August 16, 1940 as follows:

> (Add) 22. Additional Type.—Cylinders without longitudinal seams are authorized provided they comply with this specification, with exceptions and additional requirements as follows:
>
> (a) Authorized steels.—As shown in Table I.
>
> This additional type cylinder must be marked ICC 8AL.

Specification 13A has been amended by adding the words "metal drums" and also amended so that head construction shall be not less than 28 gage, U. S. Standard. Also added to this specification is the following note:

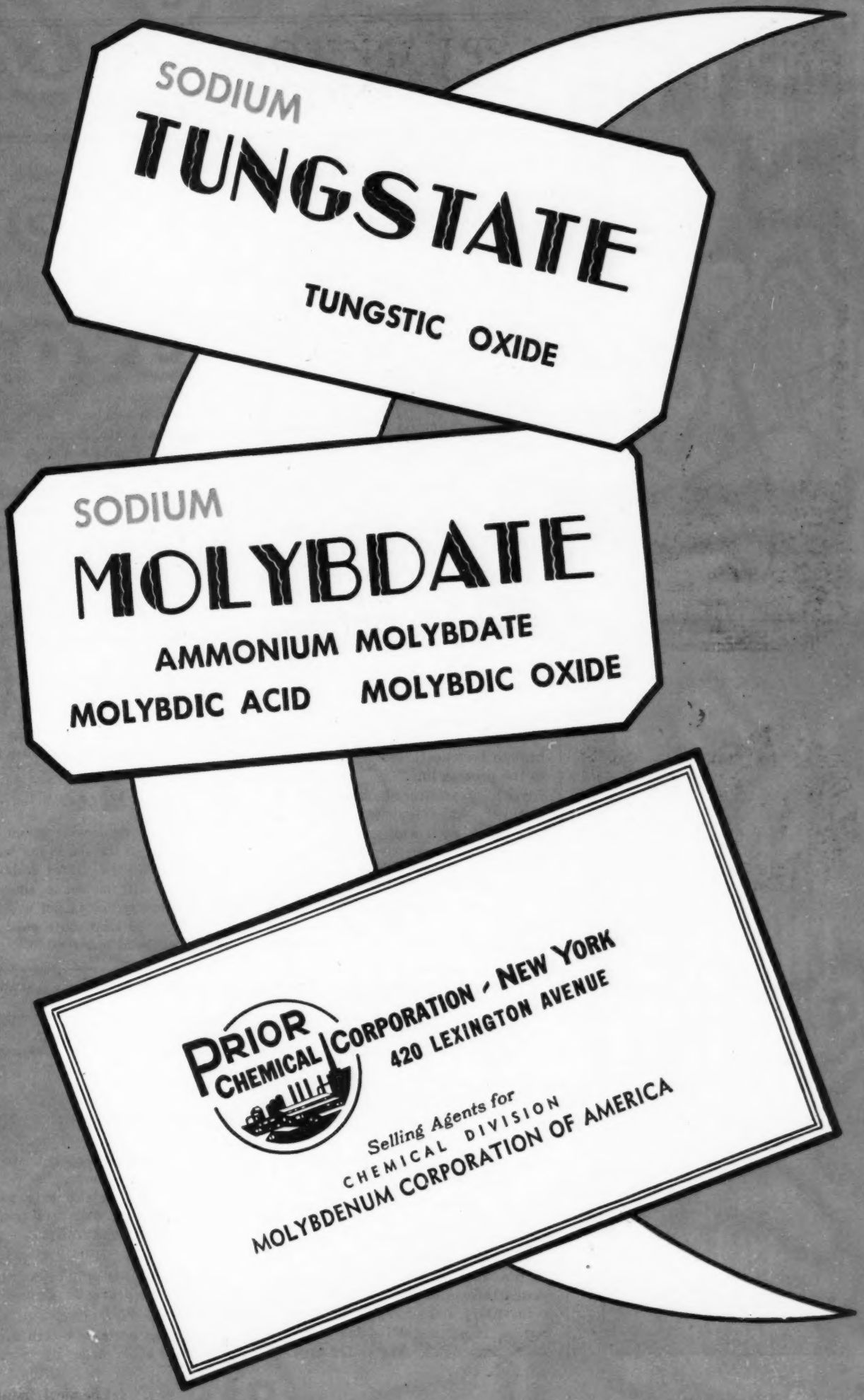
> On drums of not over 10½ gallons capacity having authorized maximum net weights not over 115 pounds, additional outside headliners may be used in lieu of metal hoops provided containers will pass prescribed tests. (See paragraph 14).

Superseding and amending paragraph 19(a), specification 23F, order August 16, 1940, to read as follows:

> 19. (a) Flap closures.—Flaps must butt or have full overlap excepting that inner flaps may overlap ½ inch when supported across the entire width of the overlap by the lining tubes.

New "Leverpak" Plant

A new Continental Can Co. paper converting plant for the manufacture of "Leverpak" fibre shipping drums is now under construction in St. Louis County, Missouri and is expected to be finished and in production by February 1, 1949.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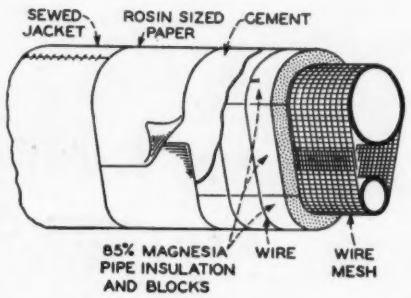
PLANT OPERATIONS NOTEBOOK

Insulating Steam-Traced and Steam-Wrapped Lines

The following suggestions on insulation of steam-traced or steam-wrapped piping with molded insulating materials such as 85% magnesia or diatomaceous silica are offered by the Magnesia Insulation Mfrs. Assn.

In steam-traced piping, a steam line, generally an inch or less in diameter, is run parallel to a process line carrying material which must be kept hot. With steam-wrapped piping, the steam line is wrapped spirally around the process line. In either case the insulation construction should surround both pipes so as to permit the heat to be transferred from the steam to the process line.



With steam-traced lines, half-sections of semi-cylindrical molded pipe insulation, each half of the size required for its respective line, should be fitted around the process line and the steam pipe. At the two sides, blocks of the same thickness as the pipe insulation are cut to fit, and should be carefully fitted between the semi-cylindrical sections. The half-sections and the side blocks should be tightly butted together and firmly fastened in place with iron wire. All the joints should be pointed up with asbestos cement, and the entire outer surface covered with a layer of the cement reinforced with hexagonal wire mesh and troweled to a smooth, hard finish.

In some cases, before the insulation is applied, the two lines may be wrapped with wire mesh.

Steam-wrapped piping should be covered with a layer of galvanized expanded metal lath, laced in place with iron wire. The lath serves as a firm foundation for the insulation, which is then applied. Semi-cylindrical or segmental pipe insulation should be used, the size of the insulation depending upon the diameter of the process pipe plus the steam pipe. Insulation application is the same as for any pipe insulation job. The insulation sections are applied, joints butted tightly together, and fixed in place with iron wire.

Depending upon the operating conditions involved, finishes such as cement, sewed canvas, asphalt saturated asbestos roofing felt, metal jackets, etc., may be used to provide a cover for the insulation.

Electrical Cable

Yellow electrical cable which can be seen plainly in the dark has been developed by United States Rubber Co. The cable will be made in various sizes and the yellow jacket will enable the wire to be seen more easily than the conventional black cable.

NOMOGRAPH-OF-THE-MONTH

Edited by DALE S. DAVIS

Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

Nomograph for Determination of P_2O_5 Content of Crude Phosphoric Acid

by V. L. MARQUART
Curtis Pub. Co., Phila. 5, Pa.

THE manufacture of phosphoric acid by the wet process inevitably yields large volumes of various acid liquors that contain low to moderate concentrations of P_2O_5. For purposes of inventory and estimation of production, a rapid method (that employs the accompanying charts) for approximating the amount of P_2O_5 in these liquors is advantageous.

The following relationship was developed for process liquors that contain phosphoric acid:

$$P = B^{1.17}/2.25 \quad (1)$$

where P = per cent P_2O_5
and B = degrees Baume (at 60°F.) of the liquor.

This equation pertains to crude orthophosphoric acid made by digesting

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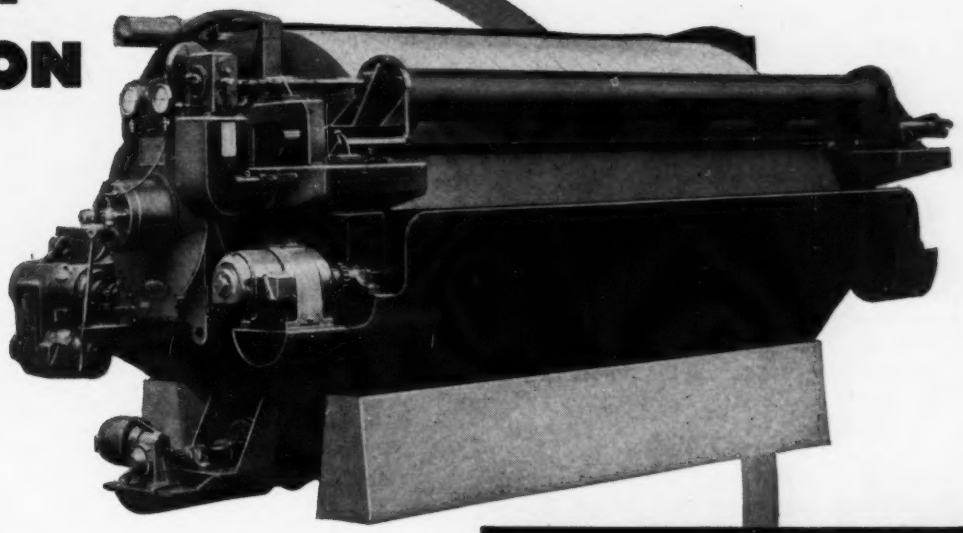

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The way the Precoat Filter works is briefly this: first a thick cake of a pervious filter medium or precoat is built up on the drum (taking an hour or two); then the solution to be filtered is fed into the tank or vat while keeping the drum rotating and the vacuum on. The thin film of solids forming on the surface is shaved off continuously, always leaving a fresh surface of precoat for further cake deposition. In this way the cake never gets thick enough to retard or stop the flow of filtrate. That's why the Oliver Precoat can handle those "difficult-to-filter" solutions. Actual filtering cycles last from several days to several weeks continuous operation, depending upon how much precoat has to be removed each revolution.

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phosphate rock in sulfuric acid and for which a typical 'strong acid' analysis would be

P_2O_5	17.5%
H_2SO_4	1.1
F	1.2
CaO	0.7
R_2O_3	0.8
SiO_2	0.6
Na_2O	0.1

In general, the weaker acids represent wash liquors in which the constituents noted are diminished in direct proportion to the concentration. Consequently, the empirical relationship expressed in Equation 1 is not invalidated. However, any major change in the relative concentrations of the impurities, particularly in the ratio of sulfuric acid to lime, causes an unpredictable loss in accuracy, the extent of which can only be checked by trial and error.

Figure 2 is designed to convert depth of liquor in a tank, in inches, to weight of phosphorus pentoxide in pounds and requires that the density of the acid be corrected to 60°F. For temperature correction of Baume readings, an auxiliary chart (Figure 1) with adjacent scales was constructed for the experimentally determined equation:

$$t = 98\ B_c^{0.44} \qquad (2)$$

where t = observed temperature in °F.

and B_c = positive correction required to convert the observed Baume reading to a temperature of 60°F. This equation has been found adequate for all concentrations from 3° to 30° Baume.

The nomograph of Figure 2, constructed by the usual methods, employs two base equations:

$$C = x\,y \qquad (3)$$

where C = volume of liquor in tank, cubic feet

x = tank calibration in cubic feet per inch

and y = depth of liquor in tank, inches,

and

$$L = \frac{9044\ C\ B^{1.17}}{32625 - 225\ B} \qquad (4)$$

where L = weight in pounds of P_2O_5 in C cubic feet of liquor at B degrees Baume (at 60°F). Equation 4 arises from the substitution of $\delta = 145/(145 - B)$ in $\rho = 62.37\ \delta$ and the substitution of the latter equation and of Equation 1 in the expression

$$L = C\ \rho\ P/100$$

where δ = specific gravity

and ρ = density, in pounds per cubic foot.

As an example of use suppose that the following data are obtained for wash liquor that consists of weak phosphoric acid. A vertical tank, holding 4.72 cubic feet of liquid per inch, contains 79 inches of 7° Baume liquor at 97°F. On Figure 2, a straight line that connects 4.72 cubic feet per inch with 79 inches of acid in the tank will intersect the tank content scale at 373 cubic feet. Figure 1 shows that a Baume reading of 7° at 97°F. is equivalent to 7° + 0.98° at 60°F. Consequently, the line joining 370 cubic feet with 7.98° Baume intersects the total weight scale at 1240 pounds of pentoxide, the desired value.

Figure 1

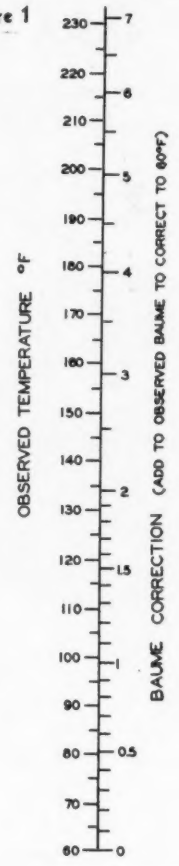
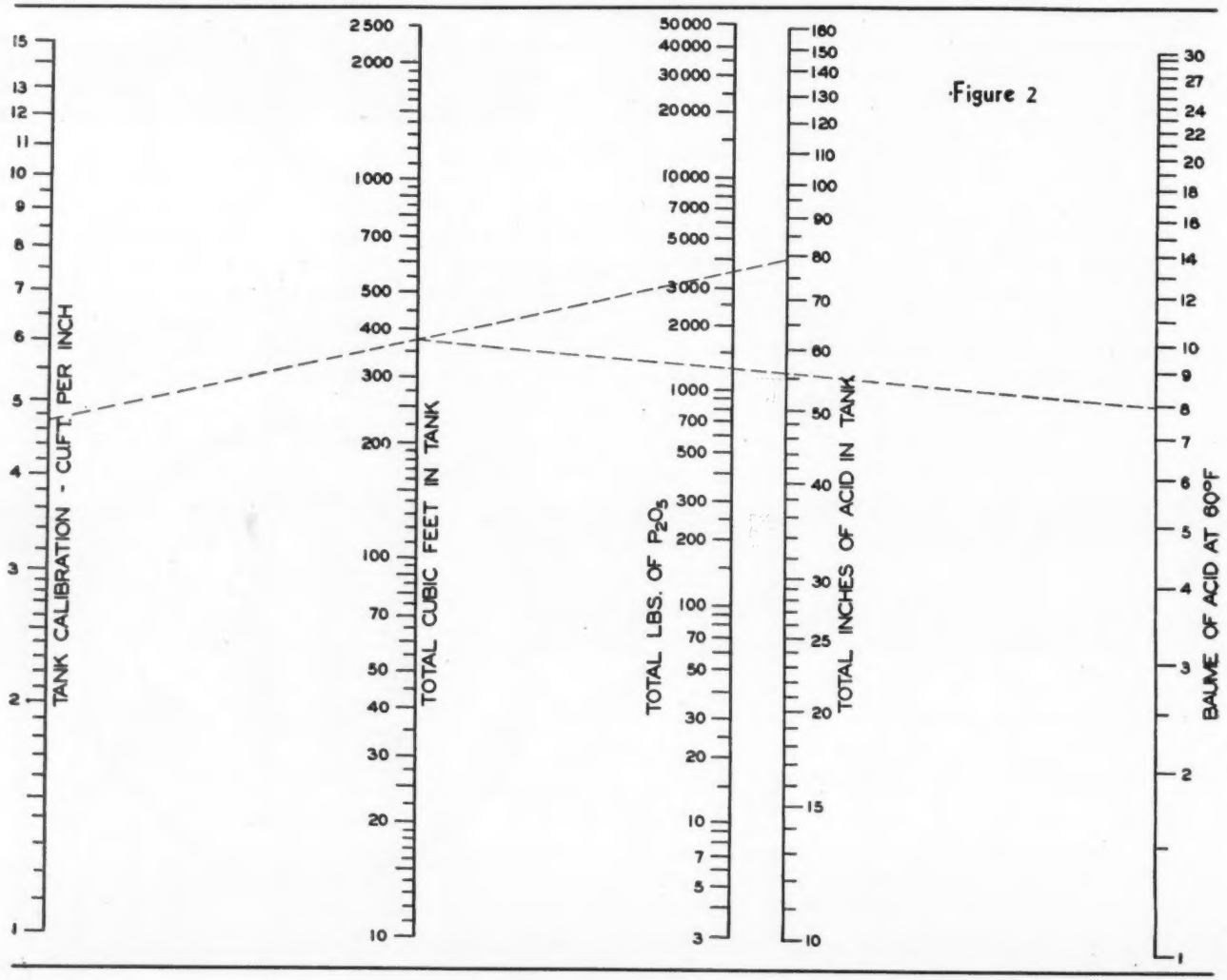


Figure 2



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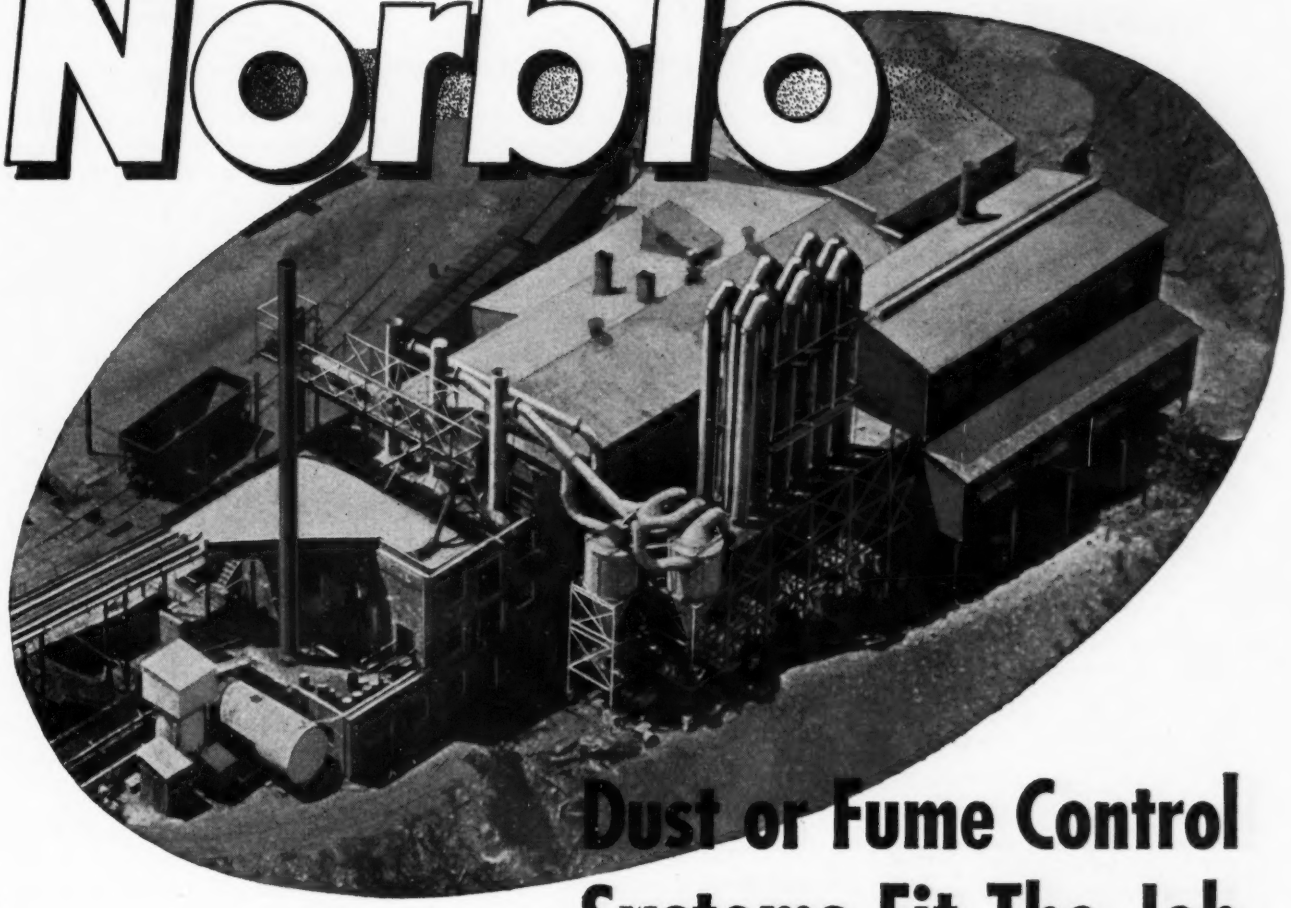

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LABORATORY NOTEBOOK

pH Scale Standardization

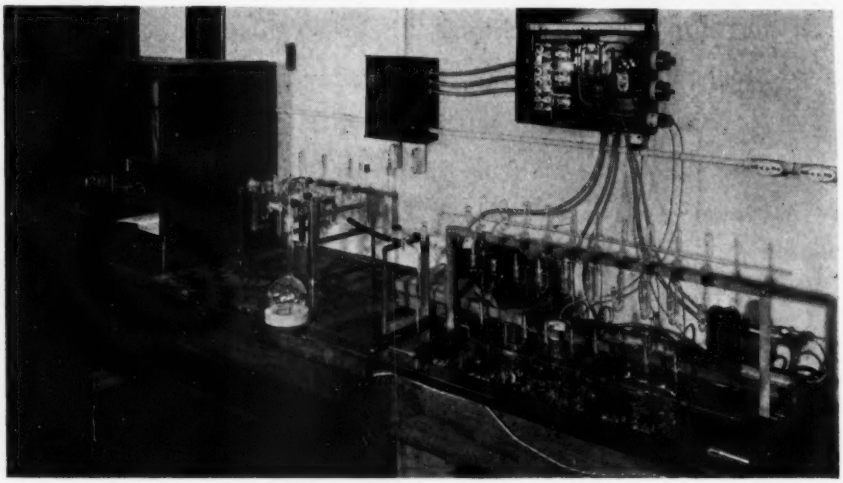
The pH unit may be defined in a number of ways, each resulting in a slightly different value. Several have seemingly met with equal favor. In view of the increasing need for accurate determinations of acidity, the National Bureau of Standards is recommending the universal adoption of a single standard pH scale, analogous to the International Temperature Scale. Further, it is proposed that the pH assigned to solutions of buffer substances distributed by the Bureau as Standard Samples be taken as the fixed points on this standard scale.

Several convenient pH meters now commercially available enable precise determinations of pH values in varied media to be made with ease and rapidity. However, these values are based upon the standard scale with which the instrument has been calibrated. For example, the pH may be defined as the negative logarithm of the hydrogen-ion concentration, the effective concentration or "activity" of this ion or, as defined by Sorensen, in terms of the electromotive force of a galvanic cell with hydrogen and calomel electrodes. Although the differences among these scales rarely exceed 0.1 unit, the need for greater accuracy makes the general adoption of a single series of consistent pH standards desirable.

To encourage standard procedure in pH measurements, the National Bureau of Standards now supplies four buffer materials in the form of standard samples of certified purity. These substances are acid potassium phthalate, potassium dihydrogen phosphate and disodium hydrogen phosphate (intended to be used together), and borax. The certificates furnished with these compounds specify the pH of certain aqueous solutions of the sample.

To assign exact values to these fixed points, it was necessary to set up a scale based on a suitable definition of pH. A consideration of the advantages and limitations of several scales led to a choice of a modified activity scale as most convenient and practical for general use. Although the activity of a single ionic species can be simply defined only in very dilute solutions, the influence of the hydrogen-ion activity in chemical equilibria is of far-reaching importance.

The pH of the NBS standards is derived from measurement of the electromotive force of cells without liquid junction, in which they are used as electrolytes. These cells are specially designed, utilizing the highly reproducible hydrogen and silver-silver chloride electrodes. Computation of pH is based upon several reasonable assumed relationships between ionic activities and mean activities. These assumptions are found to give identical values for dilute solutions. The scale thus obtained, according to the Bureau, approaches a true scale of activity for solutions of low concentration; at



Laboratory at the National Bureau of Standards in which emf data are obtained to assign pH values to solutions of standard buffer materials. Specially designed glass cells with hydrogen and silver-silver chloride electrodes are filled with the solutions and kept in an accurately controlled constant-temperature bath (at right) while electromotive force is measured on the potentiometer at left. The rack on the table contains cells in position for filling.

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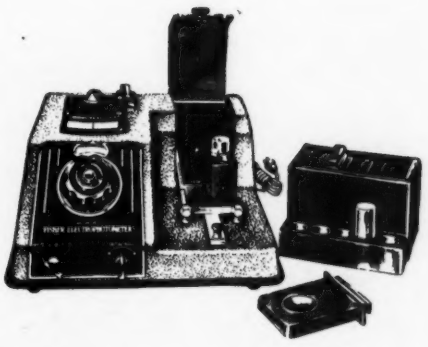

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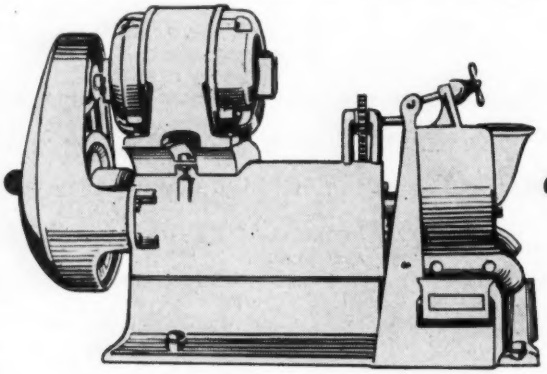

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higher ionic strengths it is best regarded as a consistent scale which necessarily rests upon an assumption not subject to experimental proof.

High-Speed Agitator

The Model No. 103 high-speed stirrer of the Nurnberg Instrument Co., 112 Broadway, Cambridge 42, Mass. offers a new tool for application to phase limited heterogeneous reacting systems such as low pressure hydrogenations, air oxidations, etc. According to the manufacturer tests have shown that if rate of reaction is limited by poor phase contact, high-speed agitation greatly increases reaction rates and in many cases enhances yields.

The Model No. 103 stirrer is adaptable to ½, 1 and 2-liter flasks. It employs a ¼ hp, 10,000 rpm universal motor. With the exception of the bearings the entire unit is constructed of stainless steel. The propeller is solid for liquid-liquid or liquid-solid reactions. If a gas phase is involved, hollow-shaft propellers can be supplied with holes in the periphery.

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The new laboratory kit (rotameter type) of the Fischer & Porter Co., Hatboro, Pa., is designed to fill the need for a versatile and inexpensive flow measurement "set" and to meet the varied flow measurement requirements of the research lab. It consists of a unique metering tube holder with base plate and hose connectors, four readily interchangeable tubes and six metering floats complete with calibration data. Capacities from 0.065 to 2200 cc/mm of water and 5.0 to 36,800 cc/min. of air are covered.

New Standard Hydrocarbons from Bureau of St'ds

The National Bureau of Standards has added thirteen more standard hydrocarbons to the 126 previously available for the calibration of analytical instruments and apparatus for the laboratory. This program was initiated in 1943 at the request of the Petroleum Industries War Council and is operated in conjunction with the American Petroleum Institute. The new standard samples are: 2,2,3-trimethylhexane; 3,3,4-trimethylhexane; cis-1,3-dimethylcyclopentane; 2-methyl-1-pentene; 4-methyl-1-pentene; 4,4-dimethyl-1-pentene; 2,3,3-trimethyl-1-butene; trans-4-octene; 1-nonene; 1-decene; 1,3-butadiene; 2-methyl-1,3-butadiene (isoprene); and 1,5-hexadiene.

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Additional physical and chemical data on this important chemical are contained in Technical Data Sheet 714, sent when requested on your letterhead. Hooker's Technical Staff is also available for consultation and help on the application of Aluminum Chloride and the other Hooker chemicals to your purposes.

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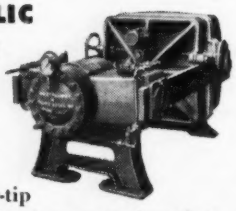

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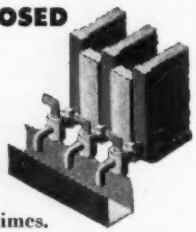

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Engineering Data

MANUAL FOR PROCESS ENGINEERING CALCULATIONS, by *Loyal Clarke*, McGraw Hill Book Co., New York. 438 pp. $6.00. Reviewed by K. T. Sloan, Chemical Engineer, Heyden Chemical Corp.

IN THE PREFACE to the volume, the author states "Industry is full of equipment that has been installed because someone timidly ventured 'It seems about the right size.' To increase the accuracy of this kind of guesswork, each engineer has his own file of favorite charts and data." The book is an example of such a file.

These files are compiled by the average engineer over a period of years as the need for specific information arises or as he spots something that catches his fancy. Often at one of his busiest moments, his file will fail him and he has to frantically search through the literature for the desired information. In an effort to help us reduce the amount of this wasted time, the author has compiled in book form the information he has found most useful.

The book is divided into thirteen chapters, the first of which outlines what he calls the "Perspective" of process engineering, while the twelve following chapters tabulate data or present nomographs and formulas. The data and charts presented include mathematical tables, unit conversion tables, thermodynamic data, data on physical and mechanical properties, data for the more common unit operations (heat transfer, fluid flow, absorption and distillation), combustion data, water data and data for pumps, blowers, fans and compressors. The data presented in tabular form are clear cut and easy to use. The nomographs are of a suitable size, and their use is clearly illustrated. The formulas presented are standard with the exception that many of the constants have been adjusted so that the data may be used as presented.

It is felt that the book is a worthwhile addition to the average engineer's shelf as a readily available source of standard data. Naturally no individual volume could contain all of the data required by the engineer but when coupled with his company's data on their specialized products, the book is a very useful tool. As the title indicates, the book is an adjunct to rather than a replacement for the standard texts and handbooks.

Colloid Chemistry

SURFACE CHEMISTRY FOR INDUSTRIAL RESEARCH, by *J. J. Bikerman*. Academic Press, Inc., New York, 1948. pp.464 + IX, $8.00. Reviewed by Jerome Alexander, consulting chemist.

THE PREFACE states: "This volume is an exposition, adapted to industrial research, of the fundamentals of Surface Science." The six chapters are as follows: (1) *Liquid-Gas*, including surface tension, capillarity, films, mists and bubbles; (2) *Liquid-Liquid*, including interfacial tension, films at interfaces, and emulsions; (3) *Solid-Gas*, including surface energy and structure, adsorption, dusts and smokes; (4) *Solid-Liquid*, including interfacial energy, heat transfer, surface heterogeneity, electro-deposition, heat of wetting, and adsorption from solutions (187 references); (5) *Solid-Liquid-Gas*, and *Solid-Liquid-Liquid*, including contact angles, imbibition and wetting adhesion, friction, lubrication; (6) *Electric Surface Phenomena*, including static electricity, electrokinetics, electrodialysis, electrocapillarity, electric double layer.

There are a large number of references and many foreign-language publications not commonly read are abstracted or referred to, some critically and mathematically. The author's original work on surface friction and lubrication is included with the huge amount of research epitomized in scholarly fashion. The discussion of lubrication does not seem to consider the work of Sir Wm. B. Hardy, or of Sir George Beilby who showed that in burnishing or polishing, local heat may cause local fusion or surface flow, yielding a so-called amorphous or Beilby layer, analogous to what happens in a wax shoe polish. The actual physical nature of surfaces is seldom as simple as is assumed in framing mathematical equations regarding their behavior.

The author seldom uses the word "colloid," though the questions he discusses commonly form part of books and papers on colloid chemistry. Perhaps the author wishes to stress surface effects, since he does not consider many other colloid questions, such as diffusion, dialysis, ultrafiltration, ultracentrifugation, sols and gels, viscosity, plasticity, thixotropy, swelling and shrinking, collodial protection.

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work reviewed, the author refers to other earlier reviews where additional information may be obtained. The book, therefore, should be of material use to those interested in the surface aspects of colloid chemistry. As usual, printing, paper and binding are excellent.

Varnish Constituents

VARNISH CONSTITUENTS, second edition, by *H. W. Chatfield*, Leonard Hill Ltd., London 1947, 572 p., $7.50. Reviewed by G. M. Sutheim, Chief Chemist, Audio Devices Inc., New York.

FOUR YEARS after the first edition was issued, Mr. Chatfield, one of the foremost European experts on paints, varnishes and lacquers, presents an enlarged second edition. The book is familiar to the American public through its American edition (Interscience Publishers Inc., New York 1944). The distribution of the subject-matter in the new edition is essentially the same, but much new material has been added. Particularly the chapters on varnish oils, rosin derivatives and synthetic resins have been brought up to date. The extensive tables which, in this reviewer's opinion, constitute the most valuable part of the book, list the constants of many thousand varnish constituents, including a large number of items which made their appearance in the post-war period.

For the American reader Mr. Chatfield's book is of considerable interest. It gives, aside of general information, a picture of the development of European methods which are, in many respects, divergent from the American approach. For research workers the rich bibliographical material, that follows each section, will be of great value. Of course, the number of references taken from American publications is very large, yet there is important reference material from British, French, German and Russian sources, some of which is hardly known in this country.

Analytical Reagents

ORGANIC ANALYTICAL REAGENTS, Vol. III, by *Frank J. Welcher*. xii + 593 pp., $8 single volume price; $7 series price. D. Van Nostrand Co., Inc., New York, N. Y., 1947. Reviewed by E. C. Dunlop, E. I. du Pont de Nemours & Co.

THIS IS the third of a five-volume treatise on the use of organic reagents in analytical chemistry. In this volume Dr. Welcher discusses nitrogen-containing organic reagents, dividing the subject into three parts: namely, Part I. Heterocyclic Nitrogen Compounds, Part II. The Oximes, Part III. Acidic Imino Compounds.

The five chapters of Part I discuss pyridine and its derivatives, quinoline and quinoline derivatives, dipyridyl and related compounds, pyrazolone derivatives, and miscellaneous heterocyclic nitrogen compounds. The nine chapters under Part II deal with the dioximes, acyloin oximes, hydroxyoximes, monoximes of diketones, isonitroso compounds, nitroso phenols, miscellaneous oximes, cupferron and neocupferron, and nitroso amines. The five chapters under Part III discuss rhodanine and its derivatives; carbazides, thiocarbazides, and semicarbazides; carbazones, thiocarbazones, and miscellaneous imino compounds. The table of contents gives the above information and in addition the names of the individual organic compounds discussed. Two indexes are included: Names and Synonyms of Organic Reagents, and Uses of Organic Reagents. The indexes are complete yet not cumbersome, thus adding to the usefulness of the book as a reference volume.

The information in this volume includes all the published literature through the year 1945. Qualitative and

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quantitative uses of the reagents are discussed, and in addition the properties and preparation of the reagents including Beilstein references are presented.

The author has fulfilled his expressed purpose in assembling all the information concerning the uses of these organic reagents (others in additional volumes) in the analysis of inorganic substances.

The analyst using this reference must be prepared to make the decisions as to the accuracy and usefulness of the procedures. This volume along with the others in the series will be an important addition to the laboratory library. Research analysts, teachers, and students (graduate) will find it a worth-while investment. The volume is well bound and is made of high-grade materials.

Paint Terms

THE NATIONAL PAINT DICTIONARY by *Jeffrey R. Stewart,* third edition, Stewart Research Laboratory, 1948. 704 pages—200 illustrations, $7.50. Reviewed by P. C. Herzog, Research Section Chief, The Glidden Co.

MR. STEWART, well known in the paint field as a consultant, has attempted to print a comprehensive dictionary of the terms used in the paint field. In spite of help from some of the paint industry's most famous technologists, his third edition still falls short of the accuracy and conciseness that would make it the standard reference volume of the industry. Many innovations in this edition, including the new smaller size, make it handier, quicker to use and more complete than previous efforts. However, the number of inaccuracies occurring must be mentioned as they definitely detract from the book's value as an authoritative text.

It is the reviewer's belief that Mr. Stewart, in a well-meaning move to print the average opinion of all paint workers, has slighted the strict accuracy of chemical and technical terms. This, of course, is true of only a minor portion of the thousands of entries, but enough to occasionally confuse a newcomer or earnest student of the industry. One of the weaknesses is the use of chemical formulas to describe commercial brand names and the complete omission of such formulas on many general chemicals when a graphic formula could be useful in many instances.

This reviewer has not found many one-volume sources of paint data such as furnished here where information can be found on raw materials, brand names, paint processes, testing instruments, colors and industrial "slang" or terminology. In this light, it may be useful to those interested in such information.

Other Publications

MONOGRAPHS ON THE PROGRESS OF RESEARCH IN HOLLAND; CHEMICAL AND PHYSICAL INVESTIGATIONS ON DAIRY PRODUCTS by H. Eilers, R. N. J. Saal and M. van der Waarden. Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y. 215 pgs., $4.00.

APPLICATION OF ELECTRIC CONVERSION EQUIPMENT TO THE ELECTROCHEMICAL INDUSTRY, several technical papers delivered at a national conference of the American Institute of Electrical Engineers. The Institute, 33 West 39th St., New York, N. Y. 33 pgs. $.80.

BEST'S SAFETY DIRECTORY FOR 1948, covering safety, fire protection and control, hygiene, first-aid and sanitation. Alfred M. Best Co., 75 Fulton St., New York, N. Y. 494 pgs. $5.00.

PRODUCTION OF ALUMINA FROM PENNSYLVANIA NODULAR DIASPORE CLAYS, bulletin 465, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $.35.

TECHNOLOGICAL DICTIONARY FOR INDUSTRIES CONSUMING DYESTUFFS AND TEXTILE AUXILIARIES, a reprint of a German-English technical dictionary privately circulated by I. G. Farben. Dictionaries, Inc., 501 Fifth Ave., New York, N. Y. 489 pgs., $12.50.

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Ferrous Salts	trace
Sulphates	0.009%
Chlorides	0.020%
Assay	99.0%
Insolubles	trace

POTASSIUM METABISULPHITE

Granular $K_2S_2O_5$

Widely used as a preservative in beverages and foods, in photographic developers, dyeing and printing of textile fabrics, lithography and engraving preparations, and as a fine chemical reagent.

HUNT'S Technical Service can help solve your problems.

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DOMESTIC EXPORT

Chemical Service Corporation
EST. 1925
96-A BEAVER ST., NEW YORK 5, N. Y.
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'Way back then, fifty years ago, bread and meat sat open on the counters. It was about then that Standard Oil Company first started its studies and experiments in light fraction petroleum refining . . . out of which came Esso Petroleum Solvents.

Down through the years the usefulness of Esso Solvents has multiplied—until today they serve the food, paint, rubber and textile industries, and hundreds of others.

TODAY MANY food packages and liquid containers have protective wrappings and linings in which Esso Solvents are widely used.

WHATEVER YOUR solvents requirements, from waxed papers to car enamels, you can order Esso Petroleum Solvents with complete assurance of their high degree of uniformity and suitability for the job.

And remember, any time you have special solvents problems, call on your Esso Solvents sales representative. He can be helpful in many ways.

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ENGINEERING PROBLEMS IN AGITATION

PART OF A CONTINUING PROGRAM OF ENGINEERING BY MIXING EQUIPMENT CO., FOR THE ADVANCEMENT OF AGITATION

TOP-ENTERING · PORTABLES · SIDE-ENTERING
LIGHTNIN
MIXCO ®

What is a safe length for an overhung agitator shaft?

4 FT? 8 FT? 16 FT?

EXPLANATION: Since step bearings generally impose an expensive schedule of shutdowns or replacement, they must be avoided when at all possible.

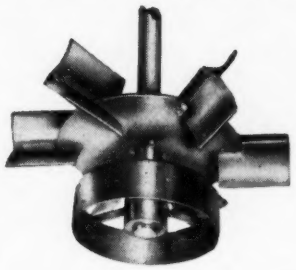
SOLUTION: Mixco Engineers have solved this problem by a thorough investigation of critical shaft speeds. All Mixco turbine type agitators are designed to operate below their critical speeds. Several critical points are recognized: (a) the critical speed in air; (b) the critical speed submerged; (c) the critical speed at liquid air break-point. The last point is extremely sensitive to hydraulic unbalance which can occur with two- and three-bladed impellers. A stabilizing device (patented) is also helpful.

By utilizing these engineering data it is possible to *safely* use overhung shafts on many models up to 13 and 15 feet in length without a step bearing in the speed range *60 to 90 RPM.*

Mixco provides the proper combination of drive, turbine impeller and shaft analysis for successful low cost installations.

TRY IT YOURSELF! If you have a small variable speed drive, deflect any shaft and impeller, pull to one side and release, and count the vibrations per minute. (This will be very close to the critical speed.) Then operate in air—changing speed very slowly.

WARNING: Be careful as you approach the critical speed—the shaft may fail violently. Then fill tank until impeller is partly covered; decrease RPM and observe. Try different impellers.



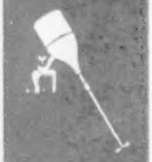
Stabilizing ring is located below the impeller and does not interfere with the flow of liquids.
(Licensed from American Metals under their covering patent No. 2195092.)

NOTE: Stabilizing rings cannot be sold separately without full information as to shaft diameter, length and speed. Dimension drawing of impeller must also be furnished and its weight must be given.

If you would like to have some phase of agitation similarly discussed, write us your suggestion. You will receive a personal reply. Write us also about your regular requirements in fluid agitation. Our wealth of background and experience gets results for you.

TOP ENTERING MIXERS

LABORATORY MIXERS



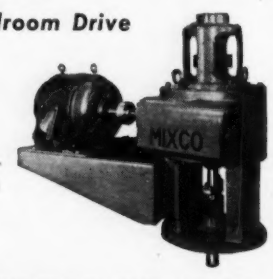
PORTABLE MIXERS

SIDE ENTERING MIXERS

OPERATES BELOW CRITICAL SPEEDS

The New Low Headroom Drive

SERIES W
1 to 50 H.P.
For open and closed tanks



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- ☐ B-66 and B-76 Side Entering Mixers
- ☐ B-78 Permanently Mounted Mixers for Pressure Vessels and Open Tanks
- ☐ B-75—Portable Mixers (Electric and Air Driven)
- ☐ B-77—Laboratory Mixers
- ☐ Mi-11—Operating Data Sheet

Mixing Equipment Co., Inc., 1049F Garson Ave., Rochester 9, N. Y.

MIXING EQUIPMENT CO., INC. · 1049 F Garson Ave., Rochester 9, N. Y.

NEWS OF THE MONTH

Borden Forms Chemical Division

The Borden Co. has announced formation of a chemical division to take over activities of Borden's Casein Co. of America and Durite Plastics divisions. William F. Leicester, who has headed the company's casein and plastics operations, will serve as president of the chemical division.

The Casein Co. of America, incorporated in 1900, was acquired by Borden's in 1929. A pioneer in casein coatings, paints, and glues, in 1937 it became the first to produce urea resin glues in this country. In addition to adhesives, the unit manufactures formaldehyde, casein and resin products, and binders for foundry use.

Durite Plastics was acquired by the Borden Co. in October, 1947. A leading producer of thermosetting synthetic resins, molding compounds and varnishes, Durite has developed furfural, resorcinol and other thermosetting resins and their derivatives for special industrial uses.

U N Conference on Resources

United Nations Scientific Conference on the Conservation and Utilization of Resources will be held in the United States in May-June 1949 under the authority of the Economic and Social Council of the United Nations. Half the program will be an examination of the contribution of improved techniques to the alleviation of shortages of mineral resources, fuel and energy, and food and forest products. In the other half, specialists will discuss such subjects as forests, water, fisheries and wild life, fuel and energy, power, mineral resources; and the interrelated group of subjects included under soils, crops, grazing and livestock resources.

Du Pont Expands Research

The announced $30 million expansion of research facilities at the Du Pont Co.'s experimental station will make that Wilmington installation one of the largest research establishments in the world. Some of the company's research organizations now located elsewhere will transfer to the new facilities. Already at the station are laboratories of the chemical, engineering, Grasselli and ammonia departments, the nylon laboratory and the Haskell toxicological laboratory. They will be joined by the rayon pioneering laboratory, by research personnel of the plastics and pigments departments and by additional Grasselli department research activities.

Major part of the plan calling for ten new laboratory and semi-works buildings and thirteen new service buildings, is an entirely new section to be built on 55 acres of the Du Pont Country Club, which is adjacent to the station. The entire job, including work on new and existing buildings as well as outside work, is to be finished in approximately two and one-half years. About 900 technical employees, double the number now required, will then be engaged in research.

New Lead Company

The Eagle-Picher Co., Cincinnati, Ohio, and Northwest Lead Co., Seattle, Washington, have formed the Associated Lead and Zinc Co., recently incorporated in the state of Washington, to be principally engaged in manufacture of lead oxides and allied products. Operation will be separate from existing facilities of the parent companies and will not affect their present manufacturing and general selling policies. Erection of the initial unit of the plant,

50 Years of Chemical Engineering

Celebrating the fiftieth anniversary of its curriculum in chemical engineering (second oldest in the country), the University of Michigan last month held a gala reunion and open house at Ann Arbor for its far-scattered Ch.E. alumni. The 250 who managed to get back heard talks by (left to right) alumnus Willard H. Dow, president, The Dow Chemical Co.; alumnus Ralph A. Hayward, president, Kalamazoo Vegetable Parchment Co.; Professor Emeritus Alfred H. White, founder and first head of the U. of M. chemical engineering department; and alumnus and Professor George Granger Brown, persent head of the department.

to be located adjacent to the Northwest Lead Co. on Harbor Island, Seattle, will commence immediately. The new enterprise, a major investment in the industry, is expected to be in production late this year.

Linde Builds Oxygen Plant

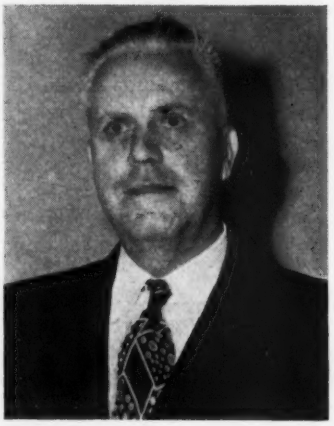
The Linde Air Products Co. will build and operate a tonnage oxygen plant to supply oxygen to the Belle, West Virginia plant of E. I. du Pont de Nemours and Co. Output will be 360 tons a day of 95 per cent pure oxygen, which will be piped directly from Linde's plant to the Du Pont plant under a long-term contractual arangement. The Linde plant will be located on Du Pont property. Construction is expected to be completed sometime in 1949.

Recently Linde announced an arrangement for erecting a plant to supply tonnage oxygen to the Wheeling Steel Corp. mill at Steubenville, Ohio.

Report Lithium Sources

Promising sources of lithium, used during the war for high-conductivity copper castings and bronzes, were marked out in the Black Hills of South Dakota by the Bureau of Mines during a wartime investigation, according to a report by that agency. In examining two ore deposits at the Edison mine near Keystone, S. Dak., Bureau engineers proved the existence of five spodumene-bearing zones. Spodumene is one of the ores from which lithium is extracted.

West Virginia Pulp Elects Wafer



Joseph M. Wafer, elected a vice-president and director of West Virginia Pulp and Paper Co. He has been general manager of the company's chemical sales division since 1943.

Freon Plant Opens

The new East Chicago, Ind. plant of Kinetic Chemicals, Inc., under construction since last August, has begun manufacturing Freon fluorine refrigerants. It is said to increase production capacity for these products by sixty per cent. Shipments from East Chicago are in ton-capacity containers only. Smaller cylinders will still be shipped from Carney's Point, N. J.

Chemical Company First Quarter Earnings

COMPANY	NET INCOME AFTER TAXES 1948	1947
Air Reduction Co.	$1,378,170	$1,427,993
American Potash & Chemical Corp.	483,000	575,000
Atlas Powder Co.	273,386	481,924
The Davison Chemical Corp.	810,000	800,000
Diamond Alkali Co.	1,054,000	1,093,000
Freeport Sulphur Co.	874,672	776,438
General Aniline & Film Corp.	1,542,900	791,200
Heyden Chemical Corp.	1,180,656	766,875
Lion Oil Co.	2,988,848	1,391,216
Mathieson Chemical Corp.	805,974	698,088
Sterling Drug Inc.	4,161,747	3,725,294
Union Carbide and Carbon Corp.	23,019,722	19,185,107

Buck Named by Ultra

Fred H. Buck, new industrial sales manager for Ultra Chemical Works, Inc. He was president of Seaboard Distributors, Inc.

Diamond Alkali Opens Houston Plant

Diamond Alkali Co. staged an "employees' preview" on the opening of its $14,000,000 chemical plant on the Houston ship channel last month. When in full operation, the huge plant will produce over $9,000,000 worth of caustic soda, chlorine, and hydrochloric acid a year. Capacity will be 220 tons of liquid chlorine daily and 240 tons of caustic soda.

A unique feature of the new plant is the color scheme which not only provides beauty but is a safety measure. By use of colors, the pipes containing

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SULFUR PRECIPITATED USP, Sylvania
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COPPER SULFATE, Crystals & Powder
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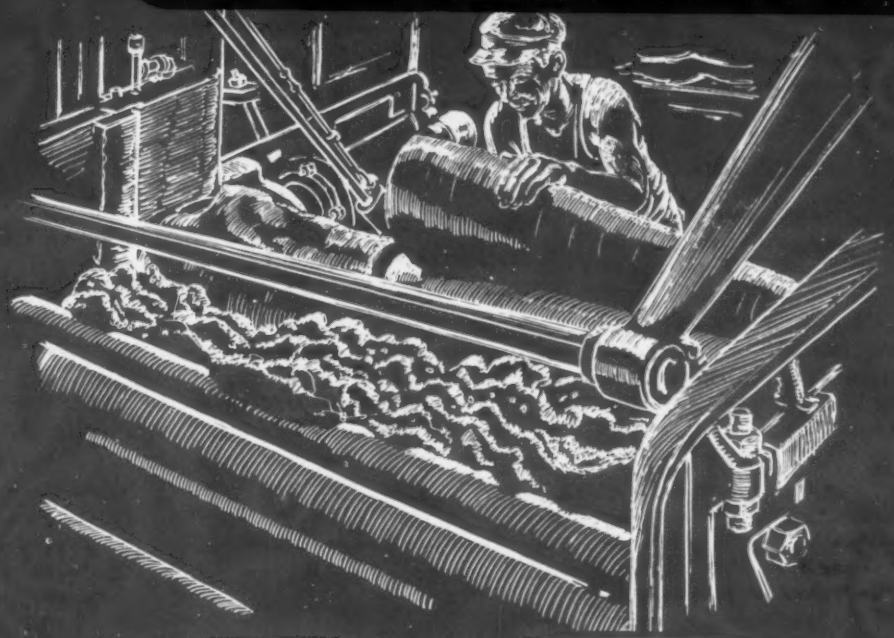
FOR THE RUBBER INDUSTRY



Stauffer manufactures a wide range of products for the rubber industry, including sulphur especially processed for rubber makers. For instance, Crystex, insoluble sulphur, preserves tack in uncured natural rubber and synthetic stock. It does not bloom and is especially useful in tire carcass stocks and in camel back. Write for new circular, "Crystex Insoluble Sulphur", which gives the facts on this interesting product.

Stauffer CHEMICALS SINCE 1885

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BHC—Benzene Hexachloride
Chlorinated Camphene
Boric Acid—Borax
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Carbon Bisulphide
Carbon Tetrachloride
Caustic Soda
Chlorine
Silicon Tetrachloride
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Sulphur Chloride
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Cohn Receives Richards Medal

Edwin J. Cohn of the Harvard Medical School received the Theodore William Richards Medal of the Northeastern Section of the American Chemical Society at its May meeting. In the presentation, Dr. Cohn, one of the world's leading authorities on the chemistry of blood, was cited for outstanding work on the physical chemistry of proteins.

Federal Chemist Positions

An examination has been announced by the Civil Service Commission for filling high-grade chemist positions in the various Federal agencies in Washington, D. C., and vicinity. The salaries range from $7,102 to $9,975 a year. One position paying $8,179 a year, in the Office of Naval Research, Boston, Massachusetts, will also be filled.

$3.5 Million Expansion For Lion

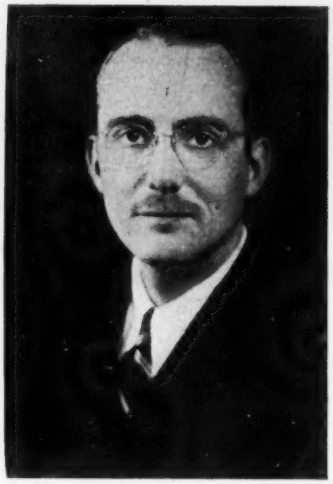
Lion Oil Co. will expand its chemical plant facilities at El Dorado, Arkansas with a $3.5 million project to increase the unit's anhydrous ammonia capacity from about 430 tons to 570 tons per day. This will make available an additional 50,000 tons annually of ammonia having a nitrogen content of approximately 83%. Included in plans is the construction of some 4,000 tons of pressure storage for ammonia necessitated by the increased volume.

Chemical Construction Corp. of New York, which as architect-engineers supervised construction and initial operation of the present ammonia plant, will handle the enlargement. Engineering work is now in progress and actual construction is expected to start in June, 1948 with completion of the entire project scheduled for the spring of 1949.

CALENDAR *of* EVENTS

AMERICAN ELECTROPLATERS' SOCIETY, annual convention, Atlantic City, June 28-July 1.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, regional meeting, French Lick, Indiana, Sept. 15-17.
AMERICAN PETROLEUM INSTITUTE, Division of Production, Eastern district, spring meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 30-July 2.
COMPRESSED GAS MANUFACTURERS ASSOCIATION, INC., Canadian Section, annual meeting, Murray Bay, Quebec, Sept. 9-11.
HEAT EXCHANGE INSTITUTE, The Homestead, Hot Springs, Va., Sept. 12-14.
THE INSTRUMENT SOCIETY OF AMERICA, national instrument conference and exhibit, Philadelphia Convention Hall, Sept. 13-17.
NORTHEASTERN WOOD UTILIZATION COUNCIL, conference, Cambridge, Mass., Sept. 17.
THIRD NATIONAL PLASTICS EXPOSITION, Grand Central Palace, New York City, Sept. 27-Oct. 2.

Thomas Elected Chairman



Charles L. Thomas, elected chairman of the Chicago Section of the American Chemical Society. He is research director of the Great Lakes Carbon Corp.

Brown Increases Facilities

A $2,500,000 expansion program, announced by Brown Instrument Co., Philadelphia, will add more than 60 per cent to its present manufacturing space. The program includes construction of a four-story addition to the main plant at Wayne Junction. Building was scheduled to begin last

MEMO NO. 2 FROM MCI

SUBJECT: *Solvent Recovery*

Within recent weeks, we have opened new fields of opportunity for several of our clients. Our experience and facilities for DISTILLATION and PURIFICATION made it possible to reclaim certain basic solvents which had, until now, been wasted or else thrown down the sewer.

We would welcome the opportunity of discussing our "recovery facilities" and its application to your processing.

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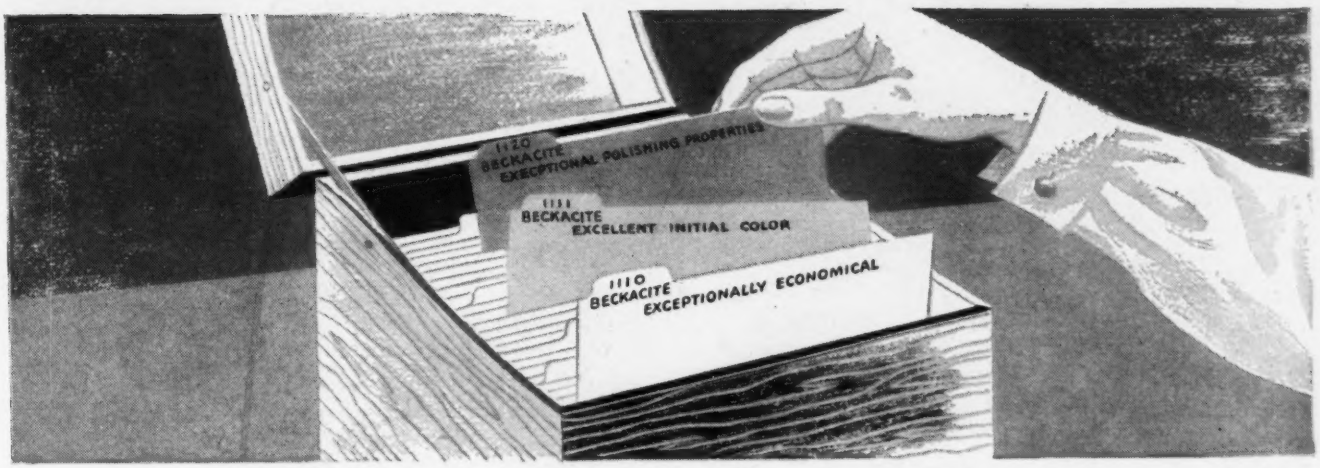

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month, with the first phase of the project to be completed next March. The foundation and footings of the new wing are designed so that four additional floors may be added later.

COMPANIES

Shareholders of the PENNSYLVANIA SALT MANUFACTURING CO. at their annual meeting have authorized the company to raise additional funds through loans to a maximum of $10,000,000. Company officials said that only a long-term loan of $3,000,000, to help finance expansion and improvement of the company's facilities, is being considered at the present time. Pennsalt's expansion program includes construction of a large new plant at Calvert City, Ky.

Ground has been broken for the construction of a chemical processing and plastics manufacturing plant in Akron, Ohio, for HARWICK STANDARD CHEMICAL CO. The new plant, to be built at an estimated cost of $300,000, will be the first of several units planned for the 5-acre tract recently purchased in East Akron.

The GLENN McCARTHY OIL & GAS CORP. has begun on the Neches River terminal at Port Neches, Texas, for the corporation's refinery and chemical plant at Winnie.

Pipelines of six-inch size will be laid connecting the terminal with the Winnie plants. Nine storage tanks and wharfing facilities for T-2 tankers will be first items finished.

Newson Joins Ferguson

Henry W. Newson, recently retained by the H. K. Ferguson Co. as full-time consultant on nuclear reactor design. He played a major part in the development of the Oak Ridge and Hanford atomic centers.

INTERNATIONAL MINERALS & CHEMICAL CORP. formally opened its new amino products plant at San Jose, Cal., with an inspection tour and luncheon for civic and industrial leaders, officers and directors of the company, and representatives of the press and radio. Principal product of the amino products division is mono sodium glutamate, an amino salt that brings out and retains the natural flavors of many foods.

The IMPERIAL SALT CO. plans a $700,000 expansion program at its Blue Ridge mine, south of Houston, Texas.

Plans are to construct a $350,000 evaporator plant, also a $250,000 rock salt plant to replace one destroyed by fire March 13. About $100,000 will be spent for new equipment.

The new evaporator plant will be finished in about four months and will begin the manufacture of table salt.

The recent decisions in the lower courts in Chicago and in Denver in the litigation between VELSICOL CORP. and JULIUS HYMAN & CO. and various individual defendants will be appealed, according to information received from Dr. Julius Hyman, president of the Denver firm.

Outright sale of the Jayhawk Ordance Works to the SPENCER CHEMICAL CO. of Kansas City for $11,010,023 has been approved by the War Assets Administration. The original cost of the plant was approximately $30 million.

Southwestern headquarters of the CABOT CARBON CO., manufacturing sub-

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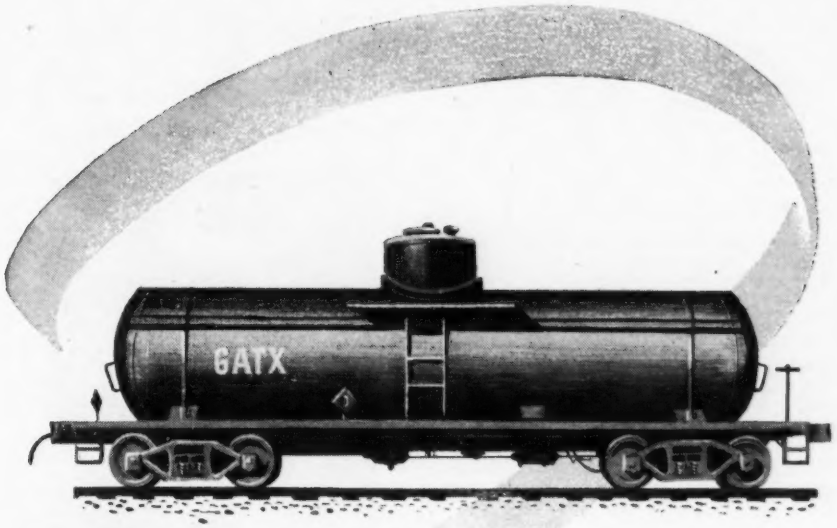

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sidiary of Godfrey L. Cabot, Inc., for the production of carbon black will be housed under one roof in Pampa as soon as construction of a new, six-story office building is completed.

The Cabot Company has assembled in one place administrative and field offices of the Texas and Oklahoma Panhandle areas.

PERSONNEL

Officers

● F. E. Barrows, member of the New York patent law firm of Pennie, Edmonds, Morton, and Barrows, has been elected president of THE CHEMISTS' CLUB, New York. Elected to serve with Mr. Barrows as vice president of the chemists' organization was R. P. Soule, of New York, who is vice president in charge of research of the American Machine and Foundry Co.

● George H. Richards, vice president and treasurer of CELANESE CORP. OF AMERICA, has been elected to the board of directors of the corporation, thus increasing the membership from 10 to 11. Mr. Richards joined Celanese in 1941 at the time of the merger with Celluloid Corp.

● James H. Stryker has been appointed executive vice president of the PERKINS GLUE CO., Lansdale, Pa. The appointment filled a vacancy left by the retirement of Mr. E. F. Gould in 1947.

● At a recent board of directors meeting, R. B. Oesting was elected a vice president of the PAUL-LEWIS LABORATORIES, Inc. He will continue in the post of director of research, which he has held since coming with the company early in 1945.

Westvaco Appoints Moran

R. F. Moran, named central process control director, Westvaco Chemical Corp. He previously was process control head at the company's South Charleston plant.

Production

● H. Arthur Howe has been named manufacturing manager of the GENERAL ELECTRIC Co's Compound Division. He has been superintendent of the Compound Division since February 1947.

● John J. Forbes, who joined the BUREAU OF MINES as a first aid miner 33 years ago last February, has been appointed chief of the Bureau's Health and Safety Division. He succeeds Daniel Harrington, retired.

● J. B. Rogerson, formerly refinery superintendent, has been advanced to the position of manager of manufacturing, LION OIL CO. As manager of manufacturing, he will assume jurisdiction over both refinery and chemical plant operations of Lion at El Dorado, Arkansas.

● Wendell G. Fogg has been appointed executive engineer of the AIR REDUCTION SALES CO. In his new capacity he will assist the director in the planning, coordination and review of the activities of the research and engineering department.

Sales

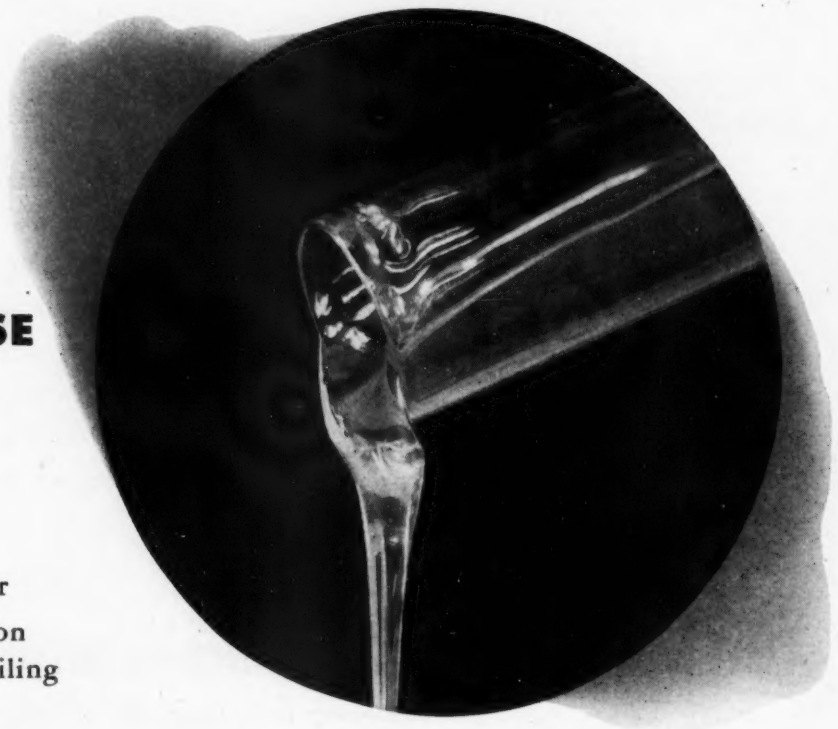
● Recently added to the staff of the Central Sales Development Department of GENERAL ANILINE & FILM CORP. were: D. A. Beadell and D. E. Sargeant, William M. Shine, Aubrey H. Nease, C. F. McKenna, Jr., and Henry C. Speel.

The expanded department is under the general supervision of Cary R. Wagner, General Aniline vice president in charge of research and development.

● The Grasselli Chemicals Department of the DU PONT CO. has appointed Howard J. Smith as assistant manager of its resale chemicals section in Wilmington and Henry F. Koll as

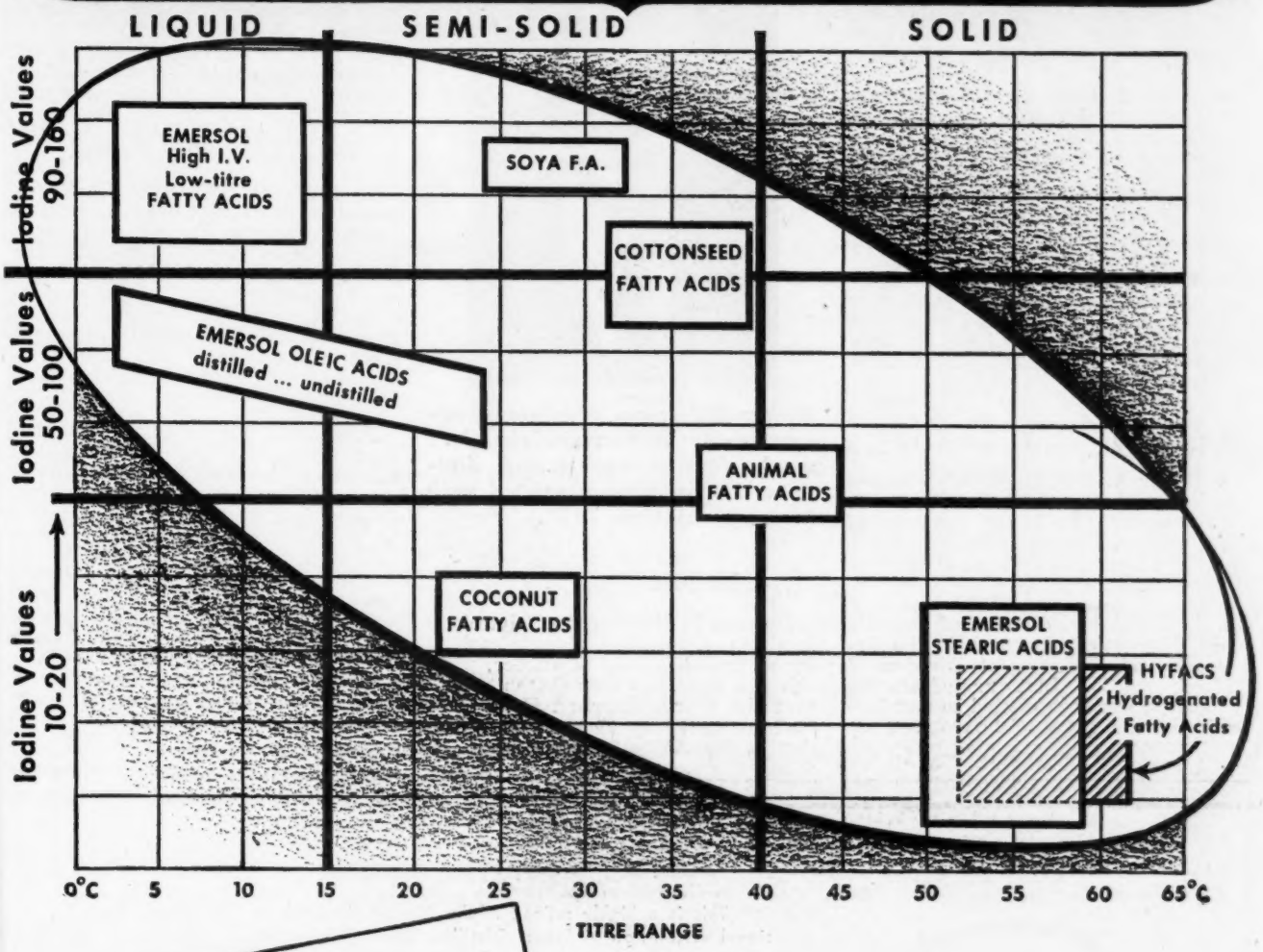
FILTERED CELLULOSE ACETATE AND NITROCELLULOSE SOLUTIONS

- wide range of viscosities and solvents
- for lacquers, sealers, adhesives, artificial leather
- convenient for modification with plasticizers, high boiling solvents, and pigments



EASTMAN KODAK COMPANY • *Cellulose Products Division* • ROCHESTER 4, N. Y.

CHECK THIS CHART—See How There Is An Emery Fatty Acid For Every Use



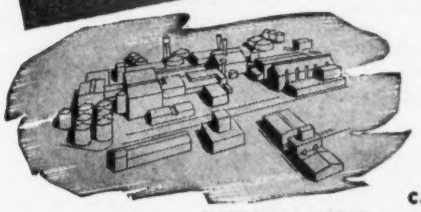
FATTY ACID ESTERS

In general, these esters though not soluble in water, exhibit surface-active properties which make them excellent dispersive blending or softening agents. Write for Bulletin 461 containing complete specifications.

Emery 2210 Glyceryl Monostearate
2230 Glyceryl Trioleate
2510 Propylene glycol monostearate
2410 Diethylene glycol monostearate
2221 Glyceryl Mono-oleate
2301 Methyl Oleate
2302 Propyl Oleate

Emery's Development Department is evaluating the polyglycol esters with various fatty acids. Working samples are available.

This chart indicates the scope of Emery's program to supply a suitable fatty acid wherever Fatty Acids will improve quality and efficiency, saving time and money. While it does not outline exact specifications, it does show the general relationship between relative iodine values and melting points. For complete technical information or use data, write to our SALES SERVICE DEPT.



EMERY INDUSTRIES, INC.

FATTY ACIDS

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187 Perry Street, LOWELL, MASSACHUSETTS
401 N. Broad Street, PHILADELPHIA 8, PA.

STEARIC ACID • OLEIC ACID • ANIMAL AND VEGETABLE FATTY ACIDS • TWITCHELL PRODUCTS • PLASTICIZERS

manager of its district office at Charlotte, N. C.

● H. A. Bonyun, Jr. has been appointed general sales manager of PUBLICKER INDUSTRIES INC. Formerly assistant sales manager, he succeeds to the position made vacant by the recent death of John H. Griffin.

● David B. Folkerth of the GENERAL ELECTRIC Co.'s plastics sales office has been named Chemical Department district representative at the Pittsburgh office. He joined the General Electric Company in 1937 as a student engineer and in 1939 he was assigned to the Plastics Division.

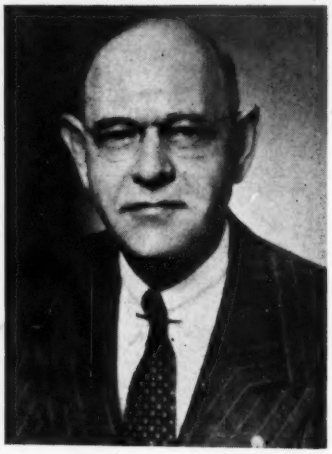
● William D. Wilson has been appointed district sales representative in Northern New Jersey and New York City for the Special Chemicals Division of the PENNSYLVANIA SALT MANUFACTURING CO.

Research

● Edgar A. Jett, II, has been named assistant director of ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology. He joined the foundation staff September 1, 1947, as director of sponsor relations.

● Karl Folkers, director of Organic and Biochemical Research in the Research and Development Division of Merck & Co., Inc., manufacturing chemists, has been elected to membership in the NATIONAL ACADEMY OF SCIENCES.

Air Reduction Names Wilkinson



Walter Wilkinson, appointed manager of Air Reduction Sales Co.'s newly formed liquefaction division. He has been associated with the company since 1917.

Associations

Herman F. Mark of the Polytechnic Institute of Brooklyn, a world authority on the chemistry of rubber, plastics and wood, has been chosen to present the fourth Harrison Howe Lecture sponsored by the Rochester Section of the AMERICAN CHEMICAL SOCIETY. The lecture will be given next November.

A gavel, sounding block and box, hand fashioned from a charred beam of the bombed-out Guildhall, London, have been made by Wallace P. Cohoe, president of the CHEMISTS' CLUB of New York, as a good will token from American chemists to their fellow scientists of Great Britain. The gift will be presented to the Society of Chemical Industry, London, by the American Section of the Society.

At the annual meeting of the WATER AND SEWAGE WORKS MANUFACTURERS ASSOCIATION, INC., the following member-companies were elected to the Board of Governors—effective January 1, 1949:
Engineering News-Record, National Water Main Cleaning Co., General Electric Company, Pittsburgh-Des-Moines Steel Co., The Dorr Company, Inc.

Election of officers at the 39th annual meeting of the AMERICAN OIL CHEMISTS' SOCIETY in New Orleans was as follows: C. P. Long, president, Procter and Gamble Co., Cincinnati; V. C. Mehlenbacher, first vice president, Swift & Co., Chicago; G. A. Crapple, second vice president, Wilson and Co., Chicago; J. R. Mays, Jr., third vice president, Barrow-Agee Laboratories, Memphis; L. B. Parsons, fourth vice president, Lever Brothers Co., Cambridge, Mass.; H. L. Roschen, secretary, Swift and Co., Chicago; and J. J. Vollertsen, treasurer, retired chief chemist Armour and Co.

CROSBY

THE MARK OF QUALITY

ALPHA PINENE

This is a highly refined Alpha Pinene obtained by the careful fractional distillation of Steam Distilled Wood Turpentine.

	SPECIFICATIONS Max.	Min.	Typical Analysis
Specific Gravity at 15.5/15.5°C	0.864	0.861	0.863
Refractive Index at 20°C	1.470	1.460	1.466
Unpolymerized Residue (38N-H_2SO_4)	1.2%	.....	0.4%
A.S.T.M. Distillation:			
Initial Boiling Point	.....	154°C	154.5°C
1%	.....	155	155.6
5%	.....	156	156.3
90%	.....	.....	157.0
97%	160	.....	158.5

Properties

Flash Point: Approximately 98° F. (Tag open cup).
Optical Rotation: +30 or higher.
Solvent Power: Kauri Butanol: Approximately 53 ml. Aniline Point: Approximately 26°C. Mixed Aniline Point (N-Heptane): Approximately 47°C.

Applications

Pinene is used in the manufacture of synthetic camphor, terpin hydrate, terpineol, synthetic resins, and as a special solvent in the formulation of certain varnishes and lacquers.

CROSBY CHEMICALS, INC.

DE RIDDER, LOUISIANA

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Davison Free Flowing Silicofluorides Offer a Tool for Many Industries
A few typical examples utilizing the acid and fluoride properties of Davison silicofluorides include their use as an anti-fermentive and as a disinfectant for copper, brass, or wooden vessels in breweries; as a laundry sour direct or in special formulae; as a concrete hardening and waterproofing agent by neutralization; as a mothproofing and dye fixing agent; and many other neutralizing and fixing as well as polymerizing and fluxing operations.
If your manufacturing processes require this acidic property of the silicofluorides or components, you are invited to consult Davison.
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Progress through Chemistry
PRIMARY PRODUCERS OF SILICOFLUORIDES
METALLIC AND FLUORIDE IONS
USEFUL AVAILABLE COMPONENTS
Davison Silicofluorides also provide a source of conveniently available metallic and fluoride ions. These components are widely utilized in alloying and refining aluminum, in casting magnesium and as an anti-fermentive and mothproofing agent.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Lever Bros. Purchases Two Products

Lever Brothers Co., Cambridge, Mass., has made another step in its expansion program by acquiring two new products, Rayve Creme Shampoo and Hedy Wave Home Permanent, and will shortly market them as Lever products. The new businesses, with their trade-marks and good will, were acquired from the William R. Warner Co., New York City.

Rayve Creme Shampoo, which was introduced in June 1944, is one of the leading sellers in the field in which it has figured as a pioneer. Hedy Wave Home Permanents were introduced in January of this year in the rapidly-expanding home permanent business field. These products will be manufactured and merchandised by the Lever's Pepsodent division.

It was announced that the transaction also involved two other Rayve products, Rayve Creme Hair Dressing and Rayve Caress Hair Dressing. These will also be marketed as Lever products through its Pepsodent division.

"1947 OTI" Still Good

The National Association of Insecticide and Disinfectant Manufacturers, Inc., has announced that the official test insecticide for the period June 1, 1947 to May 31, 1948, of which there is considerable stock on hand, has been retested and found to have little or no change in pyrethrins content since first tested. Therefore, its use has been sanctioned through October, 1948 although orders will be filled with the cartons and labels still bearing the legend, "not to be used after June 1."

Pennsalt Offers New Moth Killer

Knox Out Moths, a new liquid moth killer has been added to the list of chemicals marketed by Pennsylvania Salt Manufacturing Co.'s household products division and B-K division.

The distinctive feature of the new formula, developed and tested by Pennsalt's Whitemarsh research laboratories, is said to be that it kills both moths and larvae in three ways—by external contact, by its action as a stomach poison when eaten by the pests, and by depriving them of oxygen through its action as a fumigant. This permits the combination in one product of advantages of both the vapor type and the contact spray type of moth killers. Laboratory tests have shown it to be equally deadly to ants and roaches.

It is recommended for household use because of ease of spray-application, pleasant odor and non-staining characteristics. Knox Out Moths is packaged in pint and quart bottles.

Paisley Names Schuller Technical Director

Sam Schuller, new technical director of Paisley Products, Inc. He has served as chief chemist of the Paisley Chicago laboratories.

Refrigerant Leak Probe

Wire-like detectors, 10" long, are being sold by Kobbe Laboratories, New York City, to supplement the halide lamp in locating leaks of Freon, methyl chloride and other halogenated gases used as refrigerants. The detector is lighted, allowed to burn until a glowing tip forms, and then brought to the suspected point of leakage. If any part turns blue, a leak is indicated. A detector burns for about 12 minutes, can be used repeatedly, and can be carried easily in the pocket or tool kit.

Explains Variations in Paint Holding

In a recent publication on "Wood Properties and Paint Durability" by F. L. Browne of the U. S. Forest Service, differences between springwood and the summerwood in a board is given as a possible reason for paints' failing to stick.

Summerwood and springwood are part of the annual growth ring of the softwoods. The former is the dense, horny, and darker part, while the latter is softer and lighter in weight and color. These different zones show up as the grain of the wood when planed.

Paints sticks equally well to both summerwood and springwood when first applied, but upon ageing and becoming brittle, it loosens on the firmer and smoother summerwood while still held firmly by the springwood, it is explained. The coat of paint may stay in place if the bands of summerwood are sufficiently narrow, for it bridges over the summerwood. However, if the bands are wide, the coating may break loose from them.

Lead Arsenate Bows to DDT for Codling Moth

DDT has practically replaced arsenate of lead as a control of the codling moth in Oklahoma, reports F. A. Fenton, Oklahoma A. and M. College entomologist.

The first application of a spray for the control of the codling moth should be made when about ⅔ of the petals have fallen. The use of wettable sulfur mixed as recommended by the manufacturer or 1½ gallons commercial liquid lime sulfur plus 3 pounds of arsenate of lead for 100 gallons of spray will control scab and curculio as well as the moth.

For the second and third sprays, which are to be put on at two to three week intervals following the first, the entomologist recommends a mixture of 4-6-100 bordeaux or low-soluble copper mixed as directed by the manufacturer plus two pounds of 50 per cent wettable DDT.

Control is continued with a fourth spray approximately four weeks after the third application. In this spray formula, two pounds of wettable DDT plus 1¼ pounds of DN-111 (a Dinitrate compound) to 100 gallons of water is used.

Subseqent sprays, of the same formula, should continue at three week intervals and the number required will depend upon maturity data of the fruit.

Document Preservers

Covers and jackets made of Bakelite polyethylene plastic are being sold for protection of insurance papers and similar documents that are kept for a considerable length of time. Shellmar Products Corp., Mt. Vernon, Ohio, produces them by extruding tubing and heat-sealing one end. The covers are transparent, flexible, waterproof, light-

Investigate Cowles DRYMET*

DRYMET is commercial anhydrous sodium metasilicate. DRYMET contains no water—combined or uncombined. It is the most highly concentrated form of metasilicate on the market.

DRYMET yields more chemical value per pound than other detergent silicates—and it is priced to yield more chemical value per dollar.

DRYMET is readily soluble in all practical concentrations at all practical temperatures.

DRYMET has a total alkalinity as Na_2O of not less than 50%.

DRYMET yields a pH of 11.55 in a .06% solution. DRYMET will improve the detergent efficiency of practically every alkaline solution.

Write for DRYMET File Folder containing complete technical information and suggested formulations.

DRYMET is available for immediate shipment.

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weight, oil and grease-proof, long-wearing, non-abrasive and tear-resistant.

Insecticide Paints Research Service

Centro Research Laboratories, Briarcliff Manor, N. Y., is offering a research service concerned with the use of DDT and other such insecticides in paints. Research on the incorporation of fungicides, germicides and insecticides in paints has been conducted by the laboratory for the past two and a half years. A survey evaluating this work has been completed and now these results are being made available to paint producers as a part of a recent expansion program.

This new service includes such steps as finding the specific formulations for various types of paints; definite and detailed manufacturing instructions; and complete laboratory data based on recognized OTI tests.

Early Insecticide Orders Urged by USDA

Order insecticides early, the Department of Agriculture is advising prospective buyers. While the supply of a number of insecticides probably will be adequate for the year, it was pointed out, there may be tight supply situations in a few cases toward the end of the growing season.

As an inducement to buyers, the department notes that prices for several kinds have decreased in recent months, as well as for some chemicals used in these preparations, particularly DDT and insecticides using this material. Prices appear to be fairly well stabilized now, said the Government, and no further significant reductions are expected. Hence, placement of orders will not be affected by possible later reductions, and meantime, will help suppliers anticipate demand.

New Aerosol Formula

John Powell and Co., Inc., New York City, recently introduced its new aerosol formulation featuring the synergist, sesamin, at a demonstration in the company's laboratory. The product is currently being manufactured for use in aerosol insecticide "beer can" bombs.

Fungicide Controls Grape Disease

The outstanding development of recent experiments at the State Agricultural Experiment Station, Geneva, N. Y., with spray materials to control grape diseases is the control of black rot with an organic fungicide. Alvin J. Braun found that a black powder, sold under the names of Fermate and Karbam, did a better job than the old standby, bordeaux mixture.

In experiments conducted over four years, Fermate 2-100 controlled black rot of grapes better than bordeaux mixture 4-4-100 and 8-8-100 in seven out of eight tests. In the eighth, both gave 100 per cent control.

Fermate, the horticulturist reports, is not as effective as bordeaux mixture for the control of downy mildew and even less effective for the control of powdery mildew. However, recent tests have shown that bordeaux can safely be applied to vines which have been sprayed with Fermate earlier in the season, so bordeaux can be used in the post bloom sprays for mildew control in vineyards where these diseases are present as well as black rot.

Safe Use of 2,4-D

The increasing popularity of 2,4-D makes its proper use more important if sensitive shrubs and crops in the application area are not to be damaged. When used with caution, it should present little damage to desirable plants.

In dust form, it should never be used with a garden duster, as the slightest

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refined grades include:

Pyridine
Alpha Picoline
Mixed Picolines
2,4 Lutidine
Mixed Toluidines
Quinoline
Isoquinoline
Quinaldines

Koppers Tar Bases are soluble in many organic solvents, including alcohols, ethers, esters, hydrocarbons, and ketones. The lower-boiling bases are completely miscible with water in all proportions. The water-solubility of the bases decreases with increases in molecular weight.

Typical uses—Manufacture of pharmaceuticals and vitamins · Water-repellent finishes for cotton, rayon, silk, and wool · Solvents for dyes · Fungicides · Inhibitors in the pickling of iron and steel · Alcohol Denaturant Solvents for bitumens, oils, resins, waxes, and metallic salts · Manufacture of rubber accelerators · Catalysts in the manufacture of synthetic resins.

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a new low-cost resin

... that gives you: All around film performance equal to higher-priced conventional resins of similar end-use.

for furniture lacquers

... that give you: • Fast, smooth sanding • Good hardness • Sharp gloss and • Rapid solvent release.

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... and what's more: It's available *now* in quantities to meet your requirements.

Specifications

Melting Point (Mercury Method)	135-145°C.
Acid Value	50-60
Specific Gravity @ 25°C.	1.13-1.18
Color (Gardner Stds. '33) (50% Solution in Toluol)	10-12

U.S.I. INDUSTRIAL CHEMICALS, INC.

For samples and further information, write or phone today to —

60 East 42nd Street, New York 17, N.Y.

Branches in all principal cities

breeze may blow it on flower and vegetable gardens with disastrous results. A shaker type duster used with care permits its use for spot treatment of lawns.

The liquid form may similarly be applied if due precautions are taken. Spraying should not take place if there is any wind, and protective screens of canvass or cloth should be erected to protect plants. 2,4-D should not be used on bent grass as it is sensitive to this material.

Although application of both dust and liquid forms by airplane is successful for large areas, it should not be carried out where susceptible crops are growing in adjacent fields. It must be realized that dust or spray can be blown considerable distances with serious results.

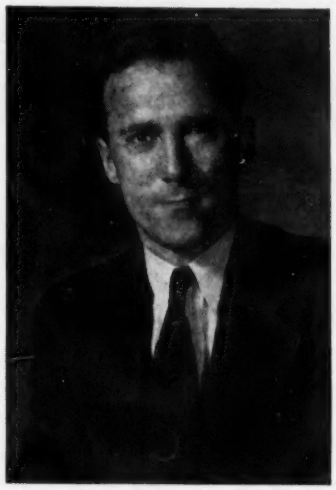
In selective weeding of small grains it is important to apply exactly the right amount of 2,4-D at the recommended time. Labels should be read and followed to the letter.

Since 2,4-D will damage or kill most legumes, over-all spraying or dusting should be done only where grasses predominate. For clover, alfalfa, and other legumes, spot application is best for clearing weed-infested areas. When directions are followed, no danger to livestock exists.

Sprayers and dusters used for 2,4-D should be reserved solely for this material and not used for insecticides or fungicides. 2,4-D is very difficult to clean from such equipment, and any residual amounts can cause damage to crops and other plants. If these applicators must be employed for other purposes, the 2,4-D should be washed out immediately after use.

Storage of this material near fertilizers, seeds, insecticides, or fungicides is strongly advised against by the USDA.

Lyons Appointed by Innis, Speiden



Joseph W. Lyons, named New England manager of Innis, Speiden & Co.'s insecticide division. He has been with the company since January, 1947.

Brushless Auto Enamel

"NU-GLOSS", an auto enamel which may be wiped on instead of sprayed or brushed on, is being sold by The Bass Co., New York. Made of resin base, the paint is guaranteed not to fade, chip, crack or peel for a 2 year period. One quart is guaranteed to cover the average size car, and costs $3.95.

Quartermaster Textile Research

According to a report now on sale by the Office of Technical Services, the development of better water repellants and shrink-resistant treatments are among current textile research projects sponsored by the U. S. Army Quartermaster Department.

Experiments are being carried out to improve water resistance with pyridinium compounds, resin wax emulsions, and silicon resins which were found to be effective water repellents during the war. Studies are being made of compounds which lend not only water resistance but also impart mildew, fire, and shrinkage resistance. Attempts are also being made to improve the uniformity and fastness of colors in military clothing.

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GUM EGYPTIAN
GUM LOCUST (Carob Flour)
QUINCE SEED

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CASEIN

SPECIALTIES:

MENTHOL (Crystals)

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TARTARIC ACID

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CHEMICAL MARKETS

Acetic Acid Heads Up

With the announcement of an increase of 1c per pound in the cost of acetic acid by Celanese Corp. of America, an apparent upward trend is taking place. The new price is 8c a pound, tankcars, f.o.b. Bishop, Texas. Increased production costs, one of which is the high price of acetaldehyde, is the reason for the advance. It has been felt that the pricing policy in this commodity has been unrealistic and that this adjustment will bring the price of the product in phase with the cost of the raw material.

Acetic acid is tight at present, and the likelihood is for it to get still tighter as the year progresses. Increased demand for such uses as rayon and monochloracetic acid for CMC is the main reason for this situation.

Potash Deliveries Set Record

Potash deliveries in North America topped the million ton mark for the first time in 1947 according to the American Potash Institute. The five leading producers and two importers delivered 1,071,270 tons K_2O, 16% over 1946. This potash was delivered in the form of 1,980,324 tons of salts. European potash salts of French and German origin appeared on the United States market again for the first time since World War II and are included in these figures. Importations of European potash into Canada are not included.

Deliveries for agricultural purposes in the continental United States for 1947 were 898,150 tons of K_2O, an increase of 134,560 tons over 1946. Canada received 39,205 tons K_2O, Cuba 4,811 tons, Puerto Rico 21,293 tons, and Hawaii 13,183 tons.

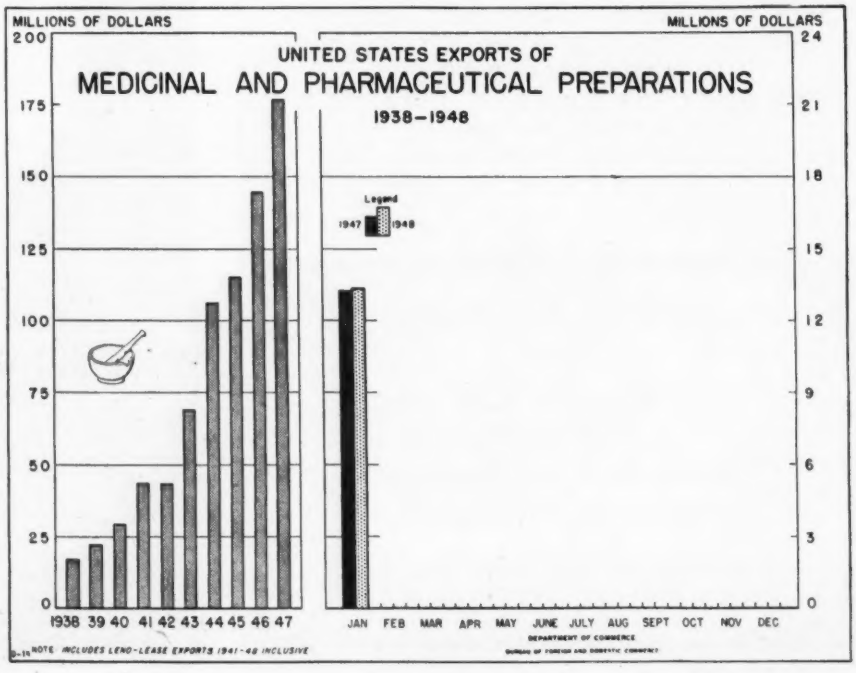
Alkyds To Remain Short

The continual increase in demand for all types of alkyd resins for coatings is not likely to be satisfied this current year. There has been no appreciable increase in the supplies of phthalic anhydride. Some replacement of phthalic resins by non-phthalic types has been the rule for some time. The better supply picture of maleic anhydride has been reflected by general availability of maleic resins.

U S D A Forecasts Steady Fats and Oil Price

According to the U. S. Dept. of Agriculture, supply prospects indicate that prices of edible and soap fats and oils in the rest of 1948 are likely to average at least as high as in March if general business activity does not decline. March prices of these fats, excluding butter, averaged about 5% below 1947.

Production of animal fats during the rest of 1948 is likely to be below a year earlier. Cattle slaughter, in relation to a year earlier, has been declining since October. Although hog slaughter probably will be about as large this spring as in the spring of



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99% PURE

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SELENIUM TELLURIUM

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CHARACTERISTICS: A Pure white, edible material—in bead form . . . is completely dispersible in hot water . . also completely soluble in alcohols and hydrocarbons (hot) . . . has a pH (3% aqueous dispersion at 25° C.) of 9.3 to 9.7 . . . melts at 58 to 59° C. (Capillary Tube) . . . is non-toxic and practically odo-less.

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1947, a decline in hog slaughter is expected next summer and fall.

Output of the vegetable oils used mainly for food probably will total about the same in 1947-48 as a year earlier. However, the seasonal decline in output this spring and summer will be sharper than a year ago because production in 1947-48 has been concentrated more heavily in the first part of the crop year. Output of the food oils in late 1948 will depend on the outturn of the 1948 oilcrops. On the basis of farmer's planting intentions March 1 and with average yields per acre, no great change from last year is in prospect for soybean or peanut production.

Net imports of all fats, oils and oilseeds into the United States in 1948, on the basis of tentative international allocations, may be about 300 million pounds in terms of oil compared with more than 400 million pounds in 1947. Tentative international allocations of fats and oils for 1948 include a recommendation for substantially smaller net imports of coconut oil and copra in terms of oil into the United States than in 1947. Total exports of Philippine copra to all countries in the first half of 1948 are expected to be reduced as a result of typhoon damage to coconut groves in late 1947.

Tentative international allocations for United States exports of food fats and oils in 1948 total 517 million pounds compared with actual exports of 640 million pounds in 1947. These totals include the shelled peanuts exported for crushing abroad, which amounted to 75 million pounds oil content in 1947 and are likely to increase in 1948.

Turpentine Market Poor

Although the general production outlook seems good, demand for both turpentine and rosin is extremely poor. Market sources are hard put to give the exact causes other than to describe the condition of the market as "sick."

Export demand is off as Europe is waiting for ERP to get rolling. Inquiries that have been made are for countries within the Russian orbit, so export licenses are at best hard to get.

Du Pont Raises Price Of Tetraethyl Lead

The Du Pont Co. has announced an increase in the price of tetraethyl lead anti-knock compounds for treating gasoline. The new price for tetraethyl lead compound motor mix, effective July 1, 1948, will be approximately 33.8c per pound, an increase of about 10%, while the price of the anti-knock compound for aviation gasoline will be slightly under 37.2c per pound.

One cause given for the new prices is the cost of metallic lead, which is now about 17c a pound as compared with prewar figure of around 6c. Rising costs of manufacturing and transportation are also cited.

Sulfur Output Up

The tonnage of native sulfur mined during the first quarter of 1948 was 22 percent greater than in the first quarter of 1947, according to the Bureau of Mines. Mine shipments increased 2 percent and apparent sales 7 percent. At the end of the quarter stocks were 7 percent lower than on March 31, 1947.

Sulfur production during March exceeded the February output by 4 percent and mine shipments increased 26 percent, whereas apparent sales were 7 percent lower. Stocks increased 19,602 long tons during the month.

License Procedure Revised

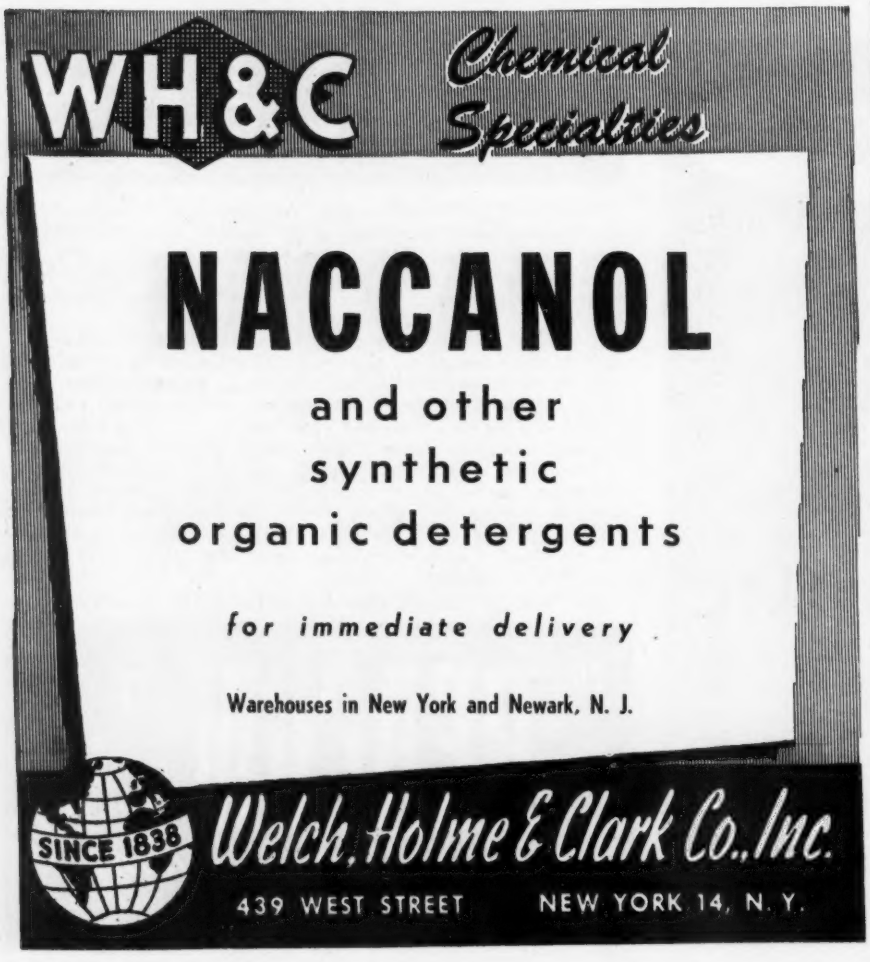
Beginning July 1, the Office of International Trade will act on applications for export of soda ash and caustic soda only once each quarter, instead of monthly, as heretofore. Because of the large number of applications backed up, those for April were either cleared or returned without action, but those for May and June will be considered in a single licensing operation toward the end of the second quarter. The change was made necessary by the disproportionately large number of applications received in relation to size of export quotas.

An attempt will be made in granting licenses to prevent exports of these commodities from being funneled into the hands of a limited number of importers abroad. To effect such regulation, licensing officials will consult closely with OIT's Commercial Intelligence Division which classifies and rates foreign importing firms.

Essential Oil Imports

Declared exports of citronella oil from Shanghai, China, to the United States in the first 3 months this year reached 36,274 pounds, valued at $31,951.

Preliminary trade estimates in China place the volume of accessible crude peppermint oil from the 1947 crop at 300,000 pounds, permitting manufacture of approximately 150,000 pounds of menthol, dependent on certain improved conditions in the country.



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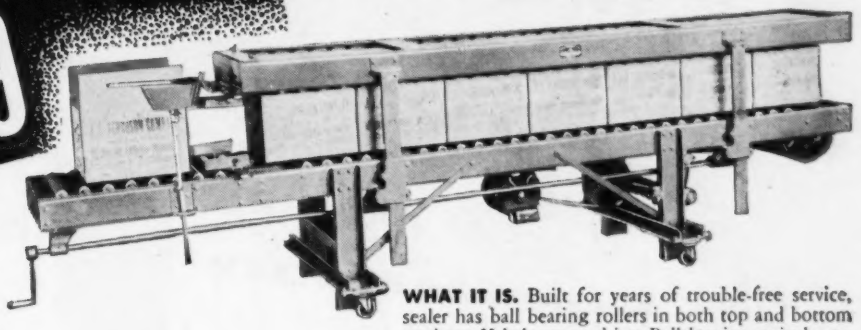

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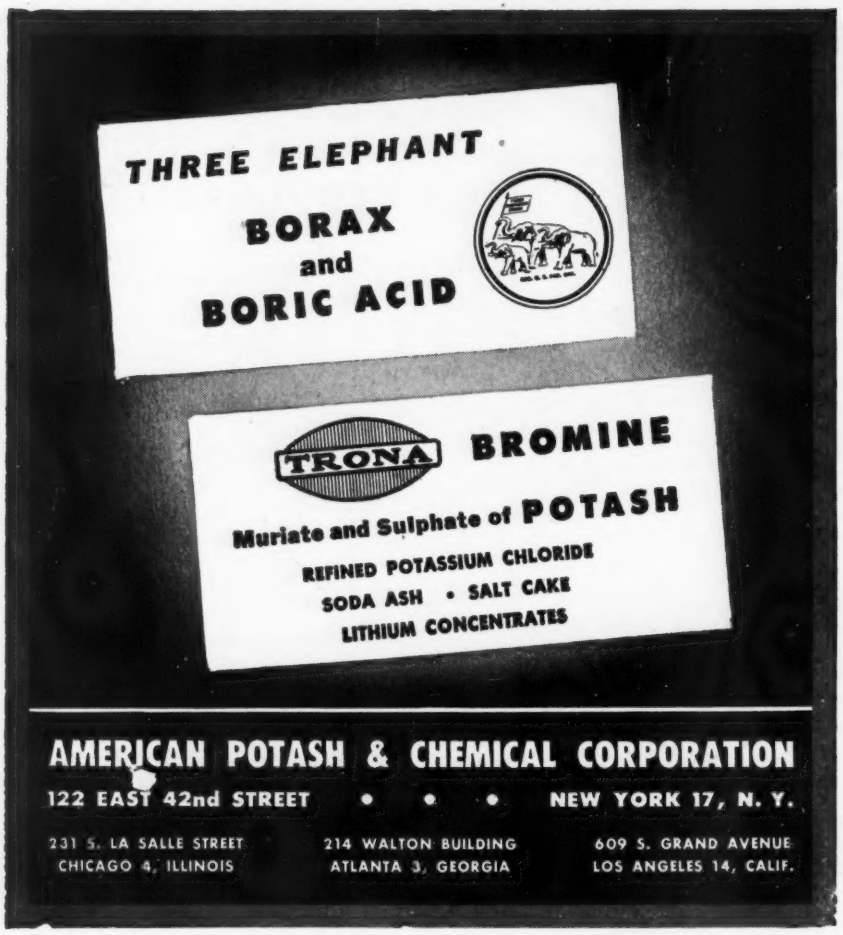

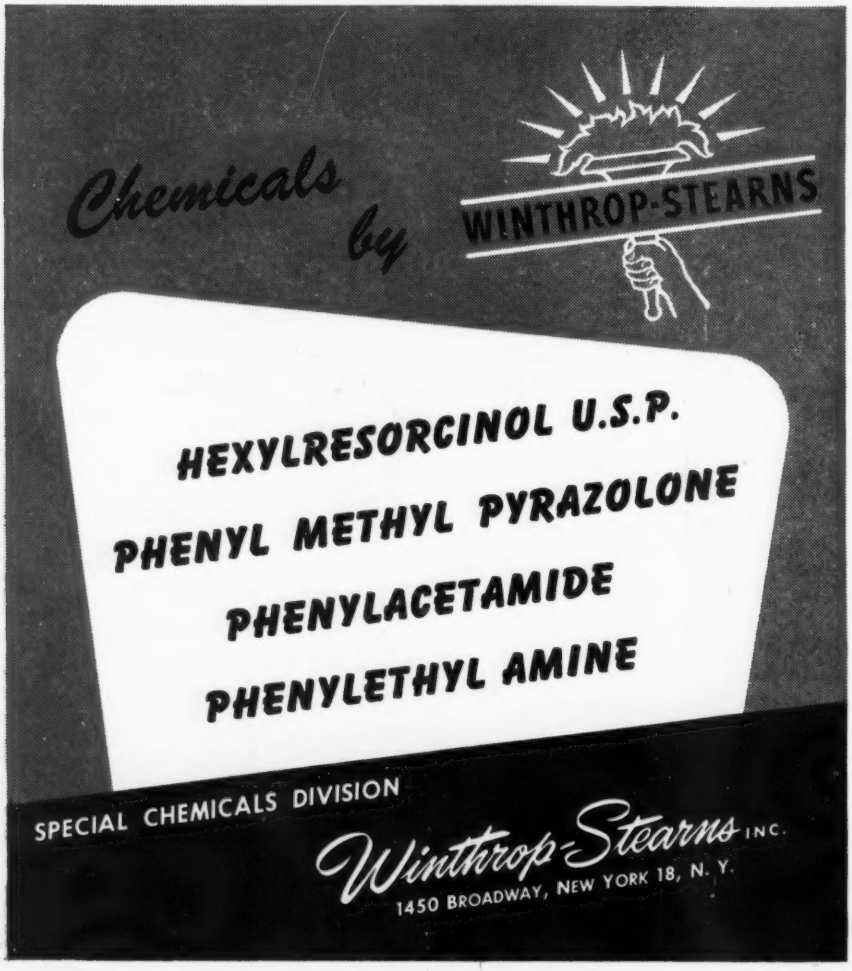

Market Review

A false picture in caustic soda and soda ash was presented by lower resale prices which reflected less activity in export demand rather than any easing of supply. Supplies were still tight, but export difficulties tended to keep the market quiet. There is an expectation that increased production of aluminum toward the end of the year will greatly sharpen demand.

Slow soap sales kept production of this item and of glycerine down. Glycerine output was also hit by the shutdown of two meat packers who produce glycerine. There was an early rise of the crude which brought it to parity with the refined. With the easing of the tallow market because of the lack of soap activity, some lots of crude glycerine went at 27c a pound instead of the 28-29c holders had hoped to get. One big sale of over a dozen cars was reported. When Lever, Colgate and P&G announced a 6% reduction in soap, glycerine failed to follow it down because of the tight supply picture. Coupon sales were being promoted to get the housewives buying soap again.

There was little domestic activity in quebracho because of buyer resistance. Local buyers and suppliers in Argentine, the prime center, seem to be feeling each other out to see who can hold out longer. Reported purchases of large lots by Europeans have stiffened suppliers' backs.

Large arrivals of foreign quicksilver and the low price that has prevailed here were expected to halt production at the large Coast mines. The first advance in shipping price since the war was the $2 per flask more asked by the Spanish-Italian interests. This makes the price to us $54 per flask as compared with the world price of $60.

Ethyl acetate had been so inactive that it had not been generally known that a decrease of 2c a pound had been in effect for some time. Among other fine chemicals, menthol showed a sharp increase of 15c a pound. It was felt the market for menthol had been cornered by some interests in Brazil, the primary center.

Nicotinic acid was raised $1 per kilo, while riboflavin was reduced $25 per kilo. The reason given for the sharp reduction was improved manufacturing facilities.

Among other increases: sulfate of potash for agricultural purposes rose $2.50 to $32.50 a ton f.o.b., Carlsbad, N. M.; shipping prices of shellac from Calcutta showed an increase of 3-4c per pound; crude corn, cotton and soybean oils advanced 1c a pound. The shellac increase was felt to be speculative, and local houses were cautious.

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Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
May, 1946, $0.842 *May, 1947, $0.624*
May, 1948, $0.580

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Acetaldehyde, 99%, drs wks ....lb.	.11	.12	.11	.12	.11	.15
Acetic Anhydride, drs, c.l., frt. all. E. ....lb.	.13	.14½	.13	.14½	.11½	.14½
Acetone, tks, delv ....lb.	.07	.09	.07	.09	.07	.09
ACIDS						
Acetic, 28% bbls ....100 lbs.	3.78	4.08	3.78	4.08	3.38	4.08
Glacial, synthetic C. P., drs, wks ....100 lbs.	13.50	14.00	13.50	14.00	13.50	14.00
Acetylsalicylic, Standard USP ....lb.	.45	.59	.45	.59	.45	.59
Benzoic, tech, bbls....lb.	.43	.47	.43	.47	.43	.47
USP, bbls, 4,000 lbs up.lb.	....	.54	....	.54	....	.54
Boric tech, bbls, c-l, frt. split .... tons	..	124.00	....	124.00	....	124.00
Chlorosulfonic, drs, wks..lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls .... lb. *b*	.22	.23	.22	.23	.20	.23
Cresylic 50%, 210-215° low boil 50%, drs, wks, frt, equal ....gal.	1.48	1.61	1.26	1.61	1.01	1.26
Formic, 85%-90% cbys ...lb.	.12	.14½	.12	.14½	.10	.14½
Hydrofluoric, 30% steel, drs .... lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, bbls, c.l., wks .... 100 lbs.	....	4.40	....	4.40	....	4.40
44%, li ht, bbls, wks....lb.	.0815	.0855	.0815	.0855	.073	.0855
Maleic, Anhydride, drs....lb.	.25	.27½	.25	.27½	.25	.26
Muriatic 18° cbys....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.90
20° cbys, c-l, wks...100 lbs.	1.85	2.00	1.85	2.00	1.85	2.00
22° cbys, c-l, wks...100 lbs.	2.35	2.50	2.35	2.50	2.35	2.50
Nitric, 36°, cbys, wks.100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	6.30
38°, c-l, cbys, wks.100 lbs. *c*	2.35	5.50	2.35	5.50	....	5.50
40°, c-l, cbys, wks.100 lbs. *c*	6.00	6.50	6.00	6.50	....	6.50
42°, c-l, cbys, wks.100 lbs. *c*	6.50	7.00	6.50	7.00	....	7.00
Oxalic, bbls, wks....lb.	.13	.14	.13	.14	.11¾	.14
Phosphoric, 100 lb. cbys, USP ....lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls....lb.	.31	.38	.31	.38	.26	.42
Sulfuric, 60°, tks, wks....ton	12.25	13.50	12.25	13.50	....	13.50
66°, tks, wks ....ton	15.00	17.50	15.00	17.50	....	17.50
Fuming 20% tks, wks...ton	18.00	20.50	18.00	20.50	....	20.50
Tartaric, USP, bbls....lb.	.41½	.50	.41½	.50	.49½	.55
Alcohol, Amyl (from Pentane) tks, delv ....lb.	....	.25	....	.25	....	.25
Butyl, normal, syn, tks.lb.	....	.17	....	.17	....	.17
Denatured, CD, proprietary solvent ....gal. *d*	.98½	1.08½	.98½	1.08½	1.00½	1.03
Ethyl, 190 proof tks....gal.	18.04	18.13	18.04	18.13	18.04	18.08
Isobutyl, ref'd, drs....lb.	....	.13	....	.13	....	.13
Isopropyl ref'd, 91% dms .... gal.	.44	.50½	.44	.50½	.41	.50½
Alum, ammonia, lump, bbls, wks. ....100 lbs.	4.05	4.25	4.05	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks lb.	....	.10¼	....	.10¼	....	.10¼
Hydrate, light, bgs....lb.	....	.17	....	.17	....	.17
Sulfate, com'l. bgs, wks, c-l .... 100 lbs.	1.15	1.30	1.15	1.30	1.15	1.30
Sulfate, iron-free, pgs, wks .... 100 lbs.	1.95	2.25	1.95	2.25	1.75	2.50
Ammonia anhyd, cyl....lb.	.16	....	.16	....	.14½	.20
Ammonia, anhyd, frt, tank cars, wks, frt, equalized.ton	59.00	70.00	59.00	70.00	....	59.00
Ammonium Carbonate, USP lumps, drs ....lb.	.08¼	.19	.08¼	.19	.08¼	.19
Chloride, USP bbls, drms, kgs .... lb.	.13	.15	.13	.15	.13	.15
Nitrate, tech, bgs, wks...lb.	.0435	.0450	.0435	.0450	.0435	.0450
Oxalate pure, grn, bbls..lb.	.23	.29	.23	.29	.23	.29
Perchlorate, kgs ....lb.	.25	....	.25	....	.24	.25
Phosphate, dibasic tech, bgs .... lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs....lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk....ton	30.00	40.00	30.00	40.00	30.00	38.00

a Powdered boric acid $5 ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

Current Prices

Amyl Acetate Gums

		Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Amyl Acetate (from pentane)							
tks, deiv	lb.	.21	.29	.21	.29	.21	.24
Aniline, Oil, dms	lb.	.13	.15	.13	.15	.12	.14
Anthraquinone, sub, bbls	lb.	....	.70	....	.70	....	.70
Antimony Oxide, bgs	lb.	.26	.27½	.26	.27½	.21	.31
Arsenic, whl, bbls, powd	lb.	.06	.08	.06	.08	.05	.08
Barium Carbonate precip,							
wks, bgs	ton	67.50	82.00	67.50	82.00	60.00	82.00
Chloride, tech, cryst, bags,							
zone 1	ton	85.00	95.00	85.00	95.00	73.00	95.00
Barytes, floated, paper bgs	ton	....	33.30	....	33.30	....	41.95
Bauxite, bulk mines	ton	8.50	10.00	8.50	10.00	7.00	10.00
Benzaldehyde, tech, cbys,							
drs	lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks,							
frt all'd	gal.	.19	.21	.19	.21	.19	.21
Benzyl Chloride, cbys	lb.	.20	.28	.20	.28	.20	.28
Beta-Naphthol, tech, bbls,							
wks	lb.	.23	.29	.23	.29	.21	.29
Bismuth metal, ton lots	lb.	....	2.00	....	2.00	....	2.00
Blanc Fixe, 66⅔ Pulp,							
bbls, wks	ton	55.00	65.00	55.00	65.00	40.00	60.00
Bleaching Powder,							
wks	100 lbs.	2.75	3.75	2.75	3.75	2.50	3.75
Borax, tech, c-l, bgs	ton	53.50	56.00	53.50	56.00	45.00	56.00
Bordeaux Mixture, bgs	lb.	.15	.23	.15	.23	.11	.23
Bromine, cases	lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, dms	lb.	.30½	.36½	.30½	.36½	.26	.33½
Cadmium Metal	lb.	1.75	1.80	1.75	1.80	....	1.80
Calcium, Acetate, bgs	100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs	ton	50.00	140.00	50.00	140.00	50.00	90.00
Chloride, flake, bgs, c-l	ton	21.50	38.00	21.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l	ton	20.00	37.50	20.00	37.50	18.00	37.50
Gluconate, USP, bbls	lb.	.58	.65	.58	.65	.57	.65
Phosphate tri, bbls, c-l	lb.	6.50	6.80	6.50	6.80	6.50	6.80
Camphor, USP, gran, powd,							
bbls, 2,000-lb. lots	lb.	.66	.78	.66	.78	.75	.82
Carbon Bisulfide, 55-gal.							
drs	lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl	lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1,							
52½ gal. drs	lb.	.06½	.07	.06½	.07	.06	.07
Casein, Acid Precip, bgs,							
10,000 lbs. or more	lb.	.30	.35	.30	.35	.26	.35
Chlorine, cyls, lcl, wks, con-							
tract	lb.	.09	.15½	.09	.15½	.08¾	.10½
Liq, tk, wks, con-							
tract	100 lbs.	....	2.25	....	2.25	....	2.30
Chloroform, tech, drs	lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude, dms,							
c-l, wks	dm.	....	10.60	....	10.60	....	10.60
Cobalt, Acetate, bbl	lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs	lb.	1.275	1.80	1.275	1.80	....	1.80
Copper, metal	100 lbs.	....	21.50	....	21.50	21.50	24.00
Carbonate, 52-54%, bbls	lb.	.24	.26	.24	.26	.19½	.26½
Sulfate, bgs, wks cryst.							
	100 lbs.	7.60	8.00	7.60	8.00	7.10	8.60
Copperas, bulk, c-l, wks	ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs	lb.	.17¼	.19¼	.14	.19¼	.13¾	.15¾
Dibutylamine, c-l, drs, wks	lb.	.52½	.76	.52½	.76	....	.76
Dibutylphthalate, drs	lb.	.32	.38½	.32	.38½	.29	.38½
Diethylaniline, drs	lb.	....	.48	....	.48	....	.48
Diethylene glycol, drs, wks	lb.	.14	.16½	.14	.16½	.14	.15
Dimethylaniline, drs, cl,							
lcl	lb.	.21	.24¼	.21	.24¼	.20	.24¼
Dimethylphthalate, drs	lb.	.23½	.27½	.23½	.27½	.20	.24¾
Dinitrobenzene, bbls	lb.	.16	.21¾	.16	.21¾	....	.16
Dinitrochlorobenzene, dms	lb.	.14	.17	.14	.17	.14	.15½
Dinitrophenol, bbls	lb.	.22	.26¾	.22	.26¾	....	.22
Dinitrotoluene, refd., drs	lb.	.17¾	.18	.17¾	.18	....	.18
Diphenyl, bbls, lcl, wks	lb.	.15	.20	.15	.20	.15	.20
Diphenylamine, bbls	lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs	lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate syn. 85-90%,							
tks, frt. all'd	lb.	.09½	.13½	.09½	.13½	.09½	.12
Chloride, USP, bbls	lb.	.20	.22	.20	.22	.18	.22
Ethylene Dichloride, lcl, wks,							
E. Rockies, drs	lb.	.08½	.09½	.08½	.09½	.08½	.09½
Glycol, dms, cl	lb.	....	.13½	....	.13½	....	.12
Fluospar, No. 1, grd. 95-98%							
bulk, c-l mines	ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl &							
lcl	lb.	.0645	.0745	.0645	.0745	.0520	.0745
Furfural tech, tks	lb.	....	.09½	....	.09½	....	.13
Fusel Oil, ref'd, drs, dlvd	lb.	.26½	.29½	.26½	.29½	.18½	.29½
Glauber's Salt, Cryst, bgs,							
wks	100 lbs.	1.25	1.75	1.25	1.75	1.05	1.75
Glycerine dynamite, drs, c-l	lb.	.39½	.40¼	.39½	.40¼	.29½	.75¾
Crude Saponification, 88%							
to refiners tks	lb.	.23	.32	.23	.32	.23	.60

GUMS

Gum Arabic, amber sorts							
bgs	lb.	.14	.15	.14	.15	.13¾	.15
Benzoin, Sumatra, cs	lb.	.40	.45	.40	.45	.50	1.00
Copal, Congo No. 1, bgs	lb.	.26	.29	.26	.29	.26	.29
Copal, East India, chips	lb.	no prices		no prices		no prices	
Macassar DBB, bgs	lb.	.24	.25	.24	.25	.24	.25
Copal Manila	lb.	no prices		no prices		.25	....
Karaya, bbls, bxs, drs	lb.	.20	.51	.20	.51	.20	.55

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

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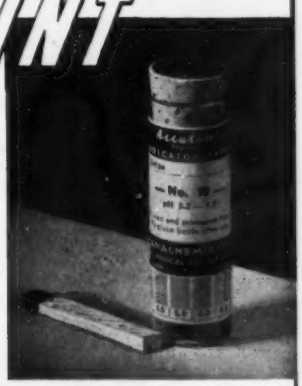
Rapid

Accurate



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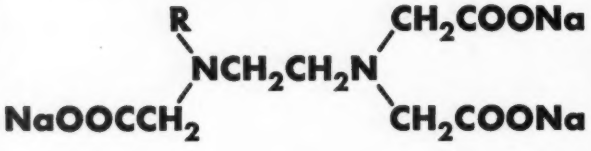

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Quaternary Ammonium Compounds

Current Prices

Gums Saltpeter

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Kauri, N. Y.						
Superior Pale XXX.....lb.	no prices		no prices		....	nom.
bgs .....lb.	....	.32¾	....	.32¾	....	.31
Sandarac, cks .....lb.	.95	1.50	.95	1.50	.85	1.00
Tragacanth, No. 1, cases...lb.	3.60	8.70	3.60	8.70	3.60	8.70
No. 3 .....lb.	2.00	2.50	2.00	2.50	2.00	3.45
Yacca, bgs .....lb.	.06	.07	.06	.07	.06	.07
Hydrogen Peroxide, cbys...lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars...lb.	2.35	2.65	2.35	2.65	....	2.65
Lead Acetate, cryst, bbls..lb.	....	.20	....	.20	....	.19¼
Arsenate basic, bg, lcl....lb.	.22¾	.23¾	.22¾	.23¾	....	.23¾
Nitrate, bbls .....lb.	.17¾	.18	.17¾	.18	....	.18
Red, dry, 96% Pb_3O_4						
bbls .....lb.	....	.20¼	....	.20¼	.14¼	.19¼
97% Pb_3O_4 bbls, delv..lb.	....	.20½	....	.20½	.15	.19½
98% Pb_3O_4, bbls, delv..lb.	....	.21½	....	.21½	.15¾	.19¾
White, bbls .....lb.	.16	.16¼	.16	.16¼	.13	.17¾
Basic sulfate, bbls, lcl.lb.	.15¼	.15½	.15¼	.15½	.12½	.15½
Lime, Chem., wks, bulk...ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks ...ton	8.00	12.14	8.00	12.14	8.00	12.14
Litharge, coml, delv, bbls..lb.	....	.19¼	....	.19¼	.13	.17½
Lithopone, ordi., bgs.....lb.	.05½	.06	.05½	.06	.03	.06
Magnesium Carb, tech, wks.lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l .....ton	....	40.00	....	40.00	....	37.00
Manganese Chloride, Anhyd. dms, wks .....lb.	.12¾	.19	.12¾	.19	.14	.16
Dioxide, Caucasian bgs, lcl .....ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, dms.gal. *l*	.63	1.10	.63	1.10	.63	.73
Synth, drs cl.....gal *m*	.34½	.41½	.34½	.41½	.31	.41½
Methyl Acetate, tech tks...lb.	.06	.09	.06	.09	.06	.07
C. P. 97-99%, tks, delv.lb.	.09½	.12	.09½	.12	.09½	.10½
Chloride Indust., cycl, wks .....lb.	.16	.41	.16	.41	.32	.41
Ethyl Ketone, tks, frt all'd .....lb.	....	.12½	....	.12½	....	.09
Naphtha, Solvent, tks ....gal.	....	.28	....	.28	....	.28
Naphthalene, crude, 74°, wks, tks .....lb.	.04½	.07	.04½	.07	.035	.083
Nickel Salt, bbls, NY.....lb.	.14	.14½	.14	.14½	.14	.14½
Nitre Cake, blk .....ton	20.00	24.00	20.00	24.00	....	24.00
Nitrobenzene, drs, wks.....lb.	.08½	.10	.08½	.10	.08	.09½
Orthoanisidine, bbls .....lb.	....	.80	....	.80	....	.70
Orthochlorophenol, drs.....lb.	.28	.37	.28	.37	.25	.37
Orthodichlorobenzene, drs..lb.	.07½	.10½	.07½	.10½	.07	.10½
Orthonitrochlorobenzene, wks .....lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs .....lb.	.08	.11	.08	.11	.08	.09
Paraldehyde, 98%, wks lcl..lb.	.12½	.13½	.12½	.13½	.22	.13½
Chlorophenol, drs .....lb.	.25	.29	.25	.29	.24	.29
Dichlorobenzene, wks ...lb.	.12½	.14	.12½	.14	.12½	.14
Formaldehyde, drs, wks..lb.	.21	.23	.21	.23	....	.22
Nitroaniline, wks, kgs...lb.	.41	.43	.41	.43	.41	.43
Nitrochlorobenzene, wks..lb.	....	.18	....	.18	....	.18
Toluenesulfonamide, bbls.lb	....	.70	....	.70	....	.70
Toluidine, bbls, wks.....lb.	.44	.53	.44	.53	....	.53
Penicillin, ampules per 100,000 units, bulk	.14	.19	.14	.19	.14	.38
Pentaerythritol, tech ....lb.	.32	.36	.32	.36	.27	.36
PETROLEUM SOLVENTS AND DILUENTS						
Lacquer diluents, tks, East Coast .....gal.	.13	.16	.13	.16	....	.14
Naphtha East, tks, wks .....gal.	.11	.14	.11	.14	....	.11
Rubber solvents, East, tks, wks .....gal.	....	.15	....	.15	....	.12
Stoddard Solvents, East, tks, wks .....gal.	.11½	.14	.11½	.14	....	.12
Phenol, U.S.P., drs .....lb.	.11¼	.13¼	.11¼	.13¼	.11¼	.13¼
Phthalic Anhydride, cl and lcl, wks .....lb.	.14½	.20	.14½	.20	.14½	.17½
Potash, Caustic 88-92%, wks, sol .....lb.	.06¾	.07½	.06¾	.07½	.06¼	.07½
flake, 88-92% .....lb.	.07½	.08¼	.07½	.08¼	.07	.08¼
liquid, 45% basis, tks..lb.	....	.03½	....	.03½	....	.03½
ds, wks .....lb.	.0337½	.0375	.0337½	.0375	.03¼	.04
Carbonate hydrated 83-85%, bbls .....lb.	.05¾	.06	.05¾	.06	.06	.05¾
Chlorate crys, kgs, wks..lb.	.08½	.09¾	.08½	.09¾	.08½	.13
Chloride, USP, cryst, bbls .....lb.	.21	.22	.21	.22	.21	.22
Cyanide, drs, wks .....lb.	....	.55	....	.55	....	.55
Iodide, drs .....lb.	1.95	1.98	1.95	1.98	1.44	1.98
Muriate dom, 60-62-63% K_2O bulk unit-ton	.37½	.53½	.37½	.53½	.37½	.53½
Permanganate, USP, wks drs .....lb.	.22½	.24	.22½	.24	.20½	.23
Sulfate, 90%, basis, bgs ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks....gal.	.03½	.06¾	.03½	.06¾	.03½	.06¾
Pyridine, reg., drs .....lb.	.60	.69	.60	.69	.55	.65
R Salt, 250 lb bbls, wks....lb.	.61	.72	.61	.72	....	.72
Resorcinol, tech. drs, wks..lb.	....	.68	....	.68	.64	.74
Rochelle Salt, cryst.....lb.	.31½	.35	.31½	.35	.32½	.35
Salt Cake, dom, blk wks...ton	20.00	28.00	20.00	28.00	....	26.00
Saltpeter, grn, bbls....100 lbs.	9.75	10.25	8.00	10.25	8.20	9.50

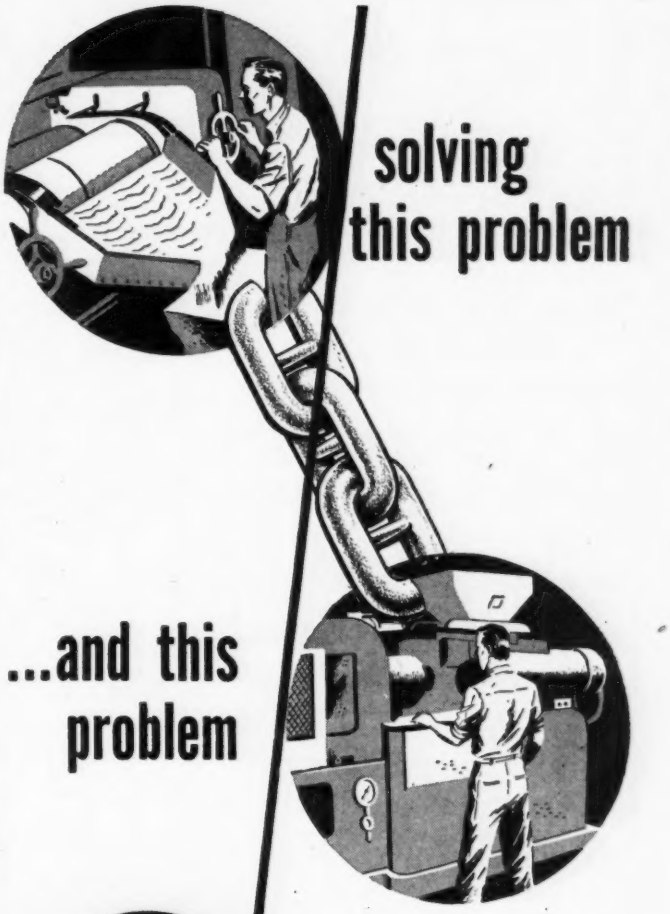
l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices

Oils & Fats
Shellac

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Shellac, blchd, bone dry, bbls ....lb.	.58½	.77	.58½	.77	.58½	.74½
Silver Nitrate, bots, 2,500-oz. lots ....oz.	.42¼	.48	.42¼	.48	.42¼	.59
Soda Ash, 58% dense, bgs, c-l, wks ....100 lbs.	....	1.38	....	1.38	....	1.38
58% light, bgs cl..100 lbs.	....	1.30	....	1.30	....	1.30
Caustic, 76% flake drs, cl ....100 lbs.	....	3.25	....	3.25	2.90	3.25
76% solids, drs, cl.100 lbs.	....	2.85	....	2.85	2.50	2.85
Liquid, 47-49%, sellers, tks ....100 lbs.	....	2.10	....	2.10	....	2.10
Acetate, anhyd. drs ....lb.	.06½	.11	.06½	.11	.06½	.11
Benzoate, USP drs ....lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs, cl., works ....100 lbs	....	2.25	....	2.25	2.25	2.59
Bichromate, bgs, wks l.c.l. ....lb.	.08¾	.09¾	.08¾	.09¾	.07⅞	.09¾
Bisulfate powd, bbls, wks ....100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls, wks ....100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks cl....lb.	....	.07¼	....	.07¼	....	.06¾
Cyanide, 96-98%, drs....lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs..lb.	.09¾	.10	.09¾	.10	.07¼	.10
Hyposulfite, cryst, bgs, cl, wks ....100 lbs.	....	2.75	....	2.75	....	2.75
Metasilicate, gran, bbl, wks c-l ....100 lbs.	3.25	3.40	3.25	3.40	....	3.40
Nitrate, imp, bgs, c.l.....ton	....	48.00	....	48.00	....	42.50
Nitrite, 96-98% bbl, cl...lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd. bgs, wks ....100 lbs.	6.25	7.00	6.25	7.00	6.00	7.00
Tri-bgs, cryst, wks ....100 lbs.	3.40	3.90	3.40	3.90	2.70	3.90
Prussiate, yel. bbls, wks..lb.	.12	.12¼	.12	.12¼	....	.12¼
Silicate, 52°, drs, wks 100 lbs.	1.55	2.00	1.55	2.00	1.40	2.00
40°, drs, wks, c-l..100 lbs.	.95	1.15	.95	1.15	....	1.15
Silicofluoride, bbls, NY..lb.	.06¼	.08½	.06¼	.08½	.06¼	.08½
Sulfate tech, Anhyd, bgs ....100 lbs.	2.10	2.60	2.10	2.60	1.70	2.60
Sulfide, cryst c-l, bbls, wks ....100 lbs.	....	3.75	....	3.75	....	3.00
Solid bbls, wks ....lb.	3.50	5.50	3.50	5.50	3.05	5.50
Starch, Corn, Pearl bgs ....100 lbs.	6.37	7.17	6.37	7.17	4.99	7.17
Potato, bgs, cl ....lb.	.0875	.1180	.0875	.1180	.0875	.1075
Rice, bgs ....lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs....lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines....ton	16.00	18.00	16.00	18.00	16.00	18.00
Flour, USP, precp, bbls, kgs ....lb.	.18	.30	.18	.30	.18	.36
Roll, bbls, ...100 lbs.	2.45	3.40	2.45	3.40	2.65	3.40
Sulfur Dioxide, liquid, cyl..lb.	....	.09	....	.09	.07	.095
tks, wks ....lb.	.04½	.05	.04½	.05	....	.044
Talc, crude, c-l, NY ....ton	....	15.00	....	15.00	....	15.50
Ref'd, c-l, NY ....ton	14.50	24.50	14.50	24.50	14.50	24.50
Tin, crystals, bbls, wks....lb.	.55	.67	.55	.67	....	.60
Metal ....lb.	....	.91	....	.91	....	.80
Toluol, drs, wks....gal.	.28	.37	.28	.37	.28	.29½
tks, frt all'd....gal.	.23	.30	.23	.30	....	.23
Tributyl Phosphates, drs, lcl, frt all'd ....lb.	.66	.72	.66	.72	....	.72
Trichlorethylene, drs, wks.lb.	.09¼	.10½	.09¼	.10½	.08	.10½
Tricresyl phosphate tks....lb.	.32¼	.36	.32¼	.36	.32¼	.33
Triethylene glycol, drs....lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls....lb.	.26	.29	.26	.29	.26	.32
Wax, Bayberry, bgs....lb.	.52	.55	.52	.55	no stocks	
Bees, bleached, U.S.P. cakes ....lb.	.65	.73	.65	.73	.68	.73
Candelilla, bgs, crude....lb.	.61	.65	.61	.65	.62	.80
Carnauba No. 1, Yellow, bgs, ton ....lb.	1.13	1.55	1.13	1.55	1.30	2.00
Xylol, Indus., frt all'd, tks wks. ....gal.	.28	.30	.23	.30	....	.28
Zinc Chloride tech, fused, wks. ....lb.	.0625	.0655	.0625	.0655	.05	.0655
Oxide, Amer., bgs, wks...lb.	....	.11	.08½	.11	.09	.10
Sulfate, crys, bgs....100 lbs.	4.15	4.90	4.15	4.90	3.40	4.90
OILS AND FATS						
Babassu, tks ....lb.	.14½	.28½	.14½	.28½	.14½	.27½
Castor, No. 3, drs, c.l....lb.	.20½	.34¼	.26½	.34¼	.27¾	.34¾
China Wood, drs, spot NY..lb.	.25¾	.27	.25¾	.27	.24	.41
Coconut, edible, drs Atlantic ports ....lb.	.18	.27	.18	.27	.18	.37
Corn, crude, tks, wks....lb.	....	.32	....	.32	....	.31
Linseed, Raw, drs, c.l....lb.	.2930	.3430	.2930	.3430	.3160	.3960
Menhaden, crude tks....	.19	.22	.19	.22	.19	.22
Light, pressed, drs l.c.l...lb.	.16	.26	.16	.26	.16	.29
Palm, Niger, dms ....lb.	no prices		no prices		no prices	
Peanut, crude, tks, f.o.b. wks ....lb.	.17	.30	.17	.30	.20	.37
Perilla, crude, dms, NY....lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks ....lb.	no prices		no prices		no prices	
Red, dms ....lb.	.17¾	.33¾	.17¾	.33¾	.17¾	.33¾
Soy Bean, crude, tks, wks..lb.	.15½	.29¾	.15½	.29¾	.15½	.33
Tallow, acidless, dms....lb.	.19½	.35	.19½	.35	.19½	.35

Bone dry prices at Chicago 1c higher; Boston ½c; Pacific Coast 2c; Philadelphia deliveries f.o.b. N. Y.; refined 6c higher in each case.



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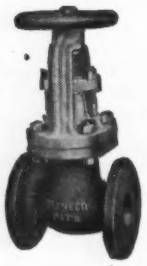

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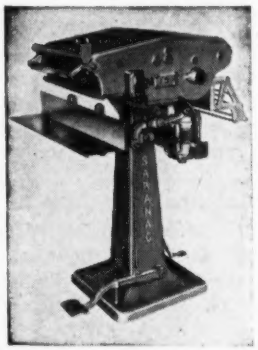

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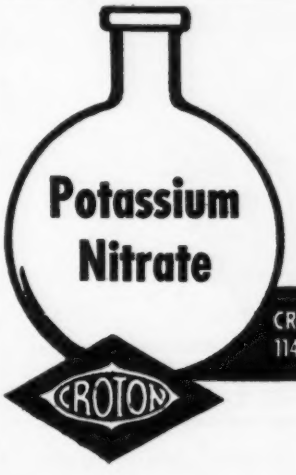

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ONE THING they've got lots of in Wyandotte, Michigan, is William Sharlow. Father William, Grandfather William, and Great-Grandfather William all work for Wyan-

dotte Chemicals Corp., but Little William is not quite old enough yet to haul drums or tot up figures. Must be confusing to hear the patter (or thump, depending on size) of eight feet when someone yells, "William Sharlow!"

THERE'S A LOT OF TALK these days about democracy, communism, and all the other ideologies men live by. E. L. Kropa, of American Cyanamid Co., drew a neat physico-chemical comparison in a technical paper recently, and we liked it: "One might digress and point out striking parallels between crystalline and amorphous products, on the one hand, and the state of society, on the other, one finds in a democracy and a totalitarian organization. In the latter, everything is organized conspicuously and under certain conditions of high orientation may exhibit considerable strength. It should be noted, however, that this strength is only in certain directions; there is a sacrifice in other directions. On the other hand, an amorphous product is also organized, but deceptively so. There is a degree of order, but one of individual nature."

BLESS THE LADIES, we always say, but sometimes we're enchanted—that's not exactly the word we were groping for—by their insistence on the feminine gender. The directors of U. S. steel apparently had their hands full with one of these militant suffragettes at their recent stockholders' meeting. The minutes of the meeting are businesslike, dispassionate, and poker-faced, but we suspect that they charitably suppress an ebullient inward merriment: "This . . . stockholder, stating that she was a representative of the women's interests, proposed that the Corporation should have a female director, and to that end she suggested that the certificate of incorporation be amended to provide for cumulative voting so that women stockholders could join together in their voting and elect a woman to the Board of Directors of the Corporation. There was no discussion of her proposal."

WE'VE FINALLY LEARNED how the Glub-Glub bird works. Those, as you may recall, are what the *New Yorker* has described as "those maddening composition birds that hover over a tumbler of water and rock back and forth in bold defiance of what we recall as being the second law of thermodynamics." The Du Pont people tell us that inside the Glub-Glub bird is a carefully measured amount of a nonflammable, volatile solvent. When the head is upright, the bird is in perfect balance. Water, when put on the head, evaporates and cools it. This cooling causes some of the liquid in the bottom to be drawn up through a small tube to the head, thus making the head heavier and upsetting the balance so that the bird tips forward and takes a drink. When this happens, the liquid flows back to the bottom making it heavy in turn, and causes the bird to stand upright. This will continue indefinitely as long as there is water in the glass to wet the bird's beak and the air is fairly dry.

Simple, isn't it?

FIFTEEN YEARS AGO

(From Our Files of June, 1933)

President Roosevelt signs Norris-Hill bill providing for Government operation of the Muscle Shoals property and embracing plans for development of the entire Tennessee Valley. This brings to a close the 13-year controversy over the disposition of the huge wartime Alabama power and nitrate plant. The new act authorizes the President to appoint a board of three as a "Tennessee Valley Authority."

The rate of decline in exports of chemicals and allied products from Germany, as compared with the U.S., in the first quarter of 1933 was less than in 1932. German exports are valued at $39,000,000. Those of the U. S. amount to $21,700,000. German imports of chemical products, however, were a little more than half those of U.S., or $9,000,000.

Henry C. Sherman, Columbia chemistry head, receives the 1933 American Institute of Chemists medal for outstanding service in the field of chemistry.

THIRTY YEARS AGO

(From Our Files of June, 1918)

Baugh Chemical Co. wins verdict for $139,433, awarded against Davison Chemical Co. for failure to deliver sulfuric acid under contract.

International Nickel Co. reports net profits of $10,129,988 for the year ended March 31.

National Aniline announces first shipment of alizarine red, this industry formerly being under German control.

Chemist discovers new process for making glycerine by fermentation of blackstrap molasses.

Du Pont establishes 18 fellowships and 33 scholarships at leading colleges to aid students in chemistry.

H. Koppers Co. is awarded contract by Jones and Laughlin Steel Co. for the construction of a by-product coke plant of 300 ovens with a carbonizing capacity of approximately 2,000,000 tons per year.

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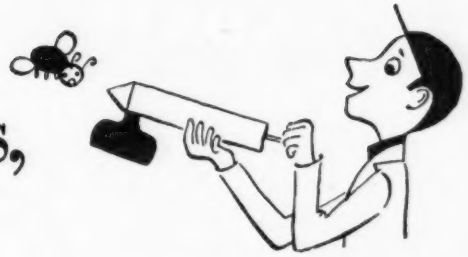

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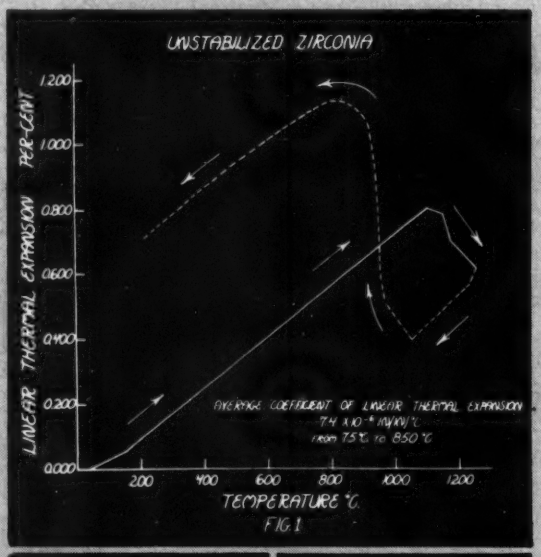


FIG. 1

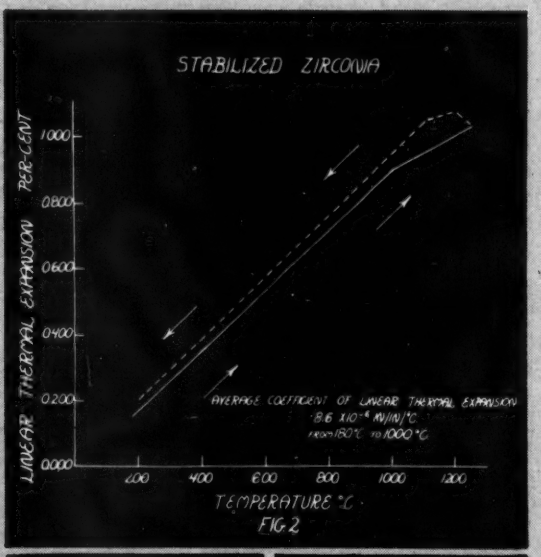
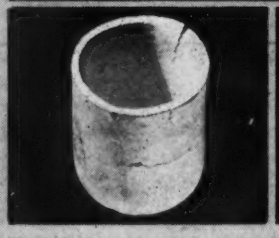
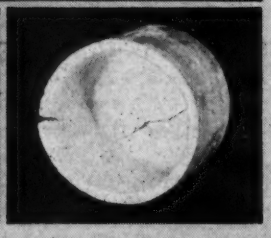
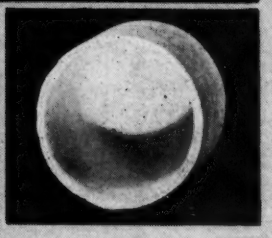


FIG. 2





Unstabilized crucible cracked badly after one cycle of air quenching from 15 minutes at 2800° F.



Crucible of stabilized zirconia did not fail after more than 20 such cycles.

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U. S. Patents from Official Gazette—Vol. 606, Nos. 2, 3, 4; Vol. 607, No. 1 (January 13–February 3)
Canadian Patents Granted and Published March 23–April 13

*Organic

Production of alkyl chloride, comprises reacting olefinic hydrocarbon with hydrous hydrogen chloride in presence of catalyst. No. 2,434,093. William Nelson Axe to Phillips Petroleum Company.

Production of alkyl chlorides by hydrochlorination of aliphatic olefins. No. 2,434,094. William Nelson Axe to Phillips Petroleum Company.

Removing thiophenols from phenols. No. 2,434,095. George W. Ayers to The Pure Oil Company.

Halogenophenylthio-2,3-epoxypropanes and halogenophenylthio-2,3-propanediols. No. 2,434,099. Euclid Wilfred Bousquet to E. I. du Pont de Nemours & Company.

Halogeno-2-carboxy-1,4-thiachromanone. No. 2,434,100. Euclid Wilfred Bousquet to E. I. du Pont de Nemours & Company.

Production of 2-methyl propanol-3-al. No. 2,434,110. Lewis F. Hatch and Theodore W. Evans to Shell Development Company.

Removing deleterious organic compounds from used electroplating bath containing hydroxyl and carbonate ions. No. 2,434,191. Harry L. Benner and Robert R. Bair to E. I. du Pont de Nemours & Company.

Production of alpha-halocrylic compounds. No. 2,434,229. David R. Saunders to General Aniline & Film Corporation.

Canadian

Reacting an ester of 3-cyano-4-carboxy-6-methyl-pyridone-2 with ammonia to produce the amide of 3-cyano-4-carboxy-6-methyl-pyridone-2. No. 446,888. Merck & Co., Inc. (Stanton A. Harris.)

Glutaric acid from cyclopentene and nitric acid. No. 446,902. Shell Development Co. (Sumner H. McAllister.)

Glutaric acid from cyclopenatanone and nitric acid. No. 446,903. Shell Development Co. (Sumner H. McAllister.)

Acetamidine anthranilate by reacting an acetamidine salt with anthranilic acid in the presence of an alkali. No. 446,960. American Cyanamid Co. (Garnet Philip Ham & Robert Bowling Barnes.)

a-1-naphthyl cinnamic nitrile. No. 446,961. American Cyanamid Co. (Ingenuin Hechenbleikner.)

Preparing melamine by heating a mixture of potassium thio-cyanamide and dicyandiamide. No. 446,962. American Cyanamid Co. (David W. Jayne Jr.)

Preparing an alkali metal salt of B-sulfopropionitrile by reacting acrylonitrile with an alkali metal bisulphite. No. 446,964. American Cyanamid Co. (Erwin L. Carpenter.)

Preparing barium salts of esters of dithiophosphoric acids. No. 446,965. American Cyanamid Co. (Kenneth D. Ashley.)

Preparing mono-aryl melamines by reacting 1,3-dicyanoguanidine and a primary aryl amine. No. 446,967. American Cyanamid Co. (Daniel E. Nagy.)

Manufacture of benzenesulphonimino derivatives comprising causing reactive benzene sulphonic acid derivatives which are substituted in the para-position of the benzene nucleus by an amino group and a group capable of conversion into an amino group to react with thiazolone-(2)-imides substituted at least at the ring nitrogen atom. No. 446,994. Ciba Limited. (Max Hartmann, Jean Druey.)

Manufacture of a:b-unsaturated aldehydes comprising subjecting to thermal splitting a member of the group consisting of a-keto-gamma-lactones. No. 446,995. Ciba Limited. (Leopold Ruzicka.)

Manufacture of aminodiphenyl-ether sulphonic acids comprising treating an alkyl substituted, halogen free aminodiphenylether sulphonic acid with a high molecular aliphatic acylating agent. No. 447,018, J. R. Geigy A. G. (Henry Martin, Hans Heinrich.)

Reacting salts of benzene-sulphonamides with a reactive carbonic acid derivative selected from the group consisting of carbamic acid halogenides, halogenocarbonic acid esters and isocyanic esters of the aliphatic, araliphatic and benzene series. No. 447,019. J. R. Geigy A. G. (Henry Martin, Rudolph Hirt, Alfred Staub.)

Preparing p-aminobenzene-sulphonamides consisting in condensing a benzene-sulphonamide, containing in p-position a group being easily convertible into the free amino group with a carboxylic acid derivative. No. 447,020. J. R. Geigy A. G. (Henry Martin, Rudolph Hirt.)

Production of a polynuclear cyclic ketone consisting in treating epidihydrocholesteryl-acetate with chromium trioxide, removing the acid oxidation products with alkaline agents expelling from the neutral parent material, separating the cyclic ketone by means of semi-carbazide, and regenerating from the semi-carbazone thus obtained the free cyclic ketone with hydrolizing agents. No. 447,065. Society of Chemical Industry. (Leopold Ruzicka.)

Method of producing ketoximes which comprises reacting a compound included in the group consisting of saturated alkyl, aryl and aralkyl ketones with a member of the group consisting of hydroxyl amine and inorganic acid salts thereof in liquid ammonia, filtering and evaporating ammonia from the filtrate. No. 447,113. American Cyanamid Co. (William H. Hill, Edward L. Kropa.)

Method of producing isocytosine which comprises bringing about reaction between an alkali metal formylacetic ester and nascent guanidine. No. 447,114. American Cyanamid Co. (Martin Everett Hultquist.)

Process of producing B-alanine which comprises catalytically reducing cyanoacetic acid. No. 447,115. American Cyanamid Co. & Lederle Labs. Inc. (Gustaf H. Carlson.)

Process of producing B-aminopropionamide which comprises reducing cyanoacetamide. No. 447,116. American Cyanamid Co., & Lederle Labs. Inc. (Gustaf H. Carlson.)

The condensation product of mercaptoarylthiazole, cyanamide and formaldehyde. No. 447,117. American Cyanamid Co. (Arnold R. Davis.)

A method of preparing melamine which comprises heating cyanouren. No. 447,119. American Cyanamid Co. (Joseph H. Paden, Johnstone S. Mackey.)

1, 2-alkoxy-3,5- dichloro-diphenyl. No. 447,137. The Dow Chemical Co. (Gerald H. Coleman, Wesley D. Schroeder.)

Process comprising hydrogenating tropinone, in organic solvent solution, in the presence of a hydrogenation catalyst, and recovering tropine. No. 447,154. Merck & Co. (Jacob van de Kamp, Meyer Sletzinger.)

Heating an aqueous solution of a steroisomeric form of a substance selected from the group consisting of the alkali-metal and alkaline-earth-metal salts of a gamma-dihydroxy-B, B-dimethyl-butyric acid until a racemate of the stereoisomers is obtained. No. 447,155. Merck & Co. (Stanton A. Harris, Karl A. Folkers.)

Reacting racemic a-hydroxy-B, B-dimethyl-gamma-butyro-l-actone with alkali to form the alkali metal salts of racemic a-gamma-dihydroxy-B, B-dimethyl butyric acid, treating the alkali metal salts with brucine-dextrorotatory a-gamma-dihydroxy-B, B-dimethyl butyric acid-brucine-acid salt formed. No. 447,156. Merck & Co. (Ralph H. Beutel, Max Tishler.)

Preparing aminothiazole derivatives which consists in treating 2-aminothiazoles with an excess of acylating agents, containing an arylsulphonyl group, and by isolating from the reaction mixture the acylation products, containing two arylsulphonyl groups. No. 447,195. Chinoin Gyogyszer es Vegyeszeti Termekek Byara R. T. (Zoltan Foldi, Rezzo Konig, Istvan Demjen.)

Process of preparing polynuclear mercaptothiazines which comprises reacting ammonia, carbon disulphide and a member of the class consisting of alicyclic ring carbon atom alpha to the carbonyl carbon linked to two hydrogen atoms and aldol-type self-condensation products of said ketones. No. 447,238. Canadian Industries Ltd. (Paul Swithin Pinkney.)

A heterocyclic compound having a methylthio radical attached to the 2-carbon atom of a thiazole ring and the thiazoline ring. No. 447,245. Canadian Industries Ltd. (William James Burke.)

Production of N,N' methylene bis-hydantoins which comprises reacting a hydantoin with formaldehyde. No. 447,248. Canadian Industries Ltd. (Joseph Frederic Walker.)

Treating a racemic pantothenic acid solution with an alkoloid to form an alkaloidal salt of racemic pantothenic acid. No. 447,302. Merck & Co. (Eric T. Stiller.)

Process for the production of pinacol which comprises forming an aqueous solution of potassium hydroxide and acetone in a simple cell provided with a nickel anode and a cathode at least the surface of which consists of amalgamated lead. No. 447,323. Shell Development Co. (De Loss E. Winkler.)

*Packaging

Container fill packing apparatus. No. 2,432,823. Matthew M. Sedwick to Continental Can Company, Inc.

Apparatus for filing containers with measured charges of material. No. 2,433,061. Paul E. Pearson and Alfred Treff to Continental Can Co., Inc.

Packaging material in container and eliminating air from head space. No. 2,433,071. Arthur E. Stevenson to Continental Can Company, Inc.

Machine for seaming ends on containers. No. 2,433,691. William John Geist to Continental Can Company, Inc.

Container. No. 2,434,014. Leon J. Rosenberg to Gaylord Container Corporation.

Canadian

Closure for a container comprising a top disc formed of fibrous sheet material, a side wall structure extending about the peripheral portion of the top disc and secured hereto. No. 446,947. (William J. Keith.)

Boxed carboy comprising a rigid carboy box, a carboy cushioned therein, and means for tightly wedging said carboy in said box at least against lateral movement. No. 447,106. Allied Chemical & Dye Corp. (William E. Watson.)

Container filling and weighing apparatus. No. 447,108. Allied Chemical & Dye Corp. (John A. Maslin.)

Laminated wrapping and bagging sheet material embodying a relatively thin flexible sheetlike substance selected from a group consisting of cellulose derivatives, vinyl resins and casein sheeting, an elastic pro-

*U.S. Patents from Vol. 606, Nos. 1, 2, 3, 4.
Canadian from February 24—March 16.

tective coating of a relatively adhesive character on both sides of said sheet-like substance, a paper sheet adhered at one side to the coating on one side of said sheet-like substance, an elastic protective coating on the other side of said paper sheet. No. 447,133. Dearborn Chemical Co. (Eugene P. Fager.)

A liquid fuel container comprising two or more layers of material bonded together with a cement comprising a solution of a polyvinyl acetal resin together with a soluble phenol-formaldehyde condensation product. No. 447,295. Imperial Chemical Industries Ltd. (Bernard James Balfe.)

*Paper, Pulp

Imitation ceramic tile comprising pressed wood fiber board base having applied composition. No. 2,432,747. Elbert R. Gilbert to E. I. du Pont de Nemours & Company.

Preparing cold swelling starch for treatment of paper. No. 2,433,285. John C. Marrone to A. M. Meincke & Son, Inc.

Canadian

Deinking waste paper containing in excess of about 5 per cent of groundwood by mild chemical treatment in the presence of an alkaline material. No. 446,883. The Mead Corporation. (Harold T. Ruff.)

In a self-sustaining unit for recovering heat and chemical from waste wood pulp liquor, a furnace, an evaporator, a mixer into which the evaporator delivers means for controllably feeding salt cake to the mixer, nozzle means furnace, a delivery line leading from the mixer to the nozzle means, a pump in said line, and a heater comprising a steam injector in said line on one side of said pump, and a heater comprising a steam injector in said line on the other side of said pump. No. 446,997. Combustion Engineering Co. (Alexander L. Hamm.)

Reclaiming wax paper broke by disintegrating the broke in water heated to temperature sufficiently high to melt the wax, adding ethanol ethylene diamine stearamide to fix the wax on the fibres and thereafter adding acetic acid. No. 447,034. National Oil Products Co. (Laurence R. Sherman, W. Ronald Benson.)

*Petroleum

Residual hydrocarbon treatment. No. 22,957. John R. Bates to Houdry Process Corporation.

Producing hydrocarbons in gasoline boiling range by averaging and alkylating. No. 2,432,505. Robert E. Burk and Everett C. Hughes to the Standard Oil Company.

Motor fuels of improved quality and lead susceptibility from higher boiling hydrocarbons. No. 2,432,537. Roger H. Newton to Houdry Process Corporation.

Converting hydrocarbon distillate heavier than gasoline into yields of gasoline. No. 2,432,634. Charles L. Thomas to Universal Oil Products Company.

Catalytic conversion of hydrocarbons. No. 2,432,644. Joseph G. Alther to Universal Oil Products Company.

Lubricating composition for use in internal combustion engines containing copper-lead bearings. No. 2,432,713. John D. Bartleson to The Standard Oil Company.

Catalytic cracking with powdered catalyst. No. 2,432,744. Wright W. Gary to Filtrol Corporation.

Catalytic conversion of hydrocarbons. No. 2,432,745. Wright W. Gary to Filtrol Corporation.

Catalytic cracking of petroleum hydrocarbons. No. 2,432,746. Wright W. Gary and Robert B. Secor to Filtrol Corporation.

Treatment of complex hydrocarbon fraction to separate one chemically similar component from other chemically similar components. No. 2,432,7[illegible]1. George R. Lake to Union Oil Company of California.

Preconditioning acid activated sub-bentonite catalyst for use in catalytic cracking of hydrocarbons. No. 2,432,822. Robert B. Secor to Filtrol Corporation.

Catalytic ring hydrogenation of mononuclear aromatic and cycloalkene hydrocarbons to corresponding saturated cycloaliphatic hydrocarbons. No. 2,432,843. Gerald M. Whitman to E. I. du Pont de Nemours & Company.

Conversion of hydrocarbons in vapor phase in which hot recycled pebbles are continuously passed through conversion zone. No. 2,432,872. Bernardo J. Ferro, Jr. to Phillips Petroleum Company.

Simultaneous catalytic cracking of two hydrocarbon oils. No. 2,432,912. Henry D. Loeb to Shell Development Company.

*Polymers

Destroying germs in fluid medium comprises treating medium containing germs with anion active resin. No. 2,434,190. Robert Bowling Barnes and Garnet Philip Ham to American Cyanamid Company.

Removing dark-resin-forming constituents and other undesirable components from resin crude containing pinene. No. 2,434,197. Edwin L. Kline to Allied Chemical & Dye Corporation.

Manufacturing cast film, sheeting and like of vinyl-type resins according to continuous process. No. 2,434,231. Andy J. Seitz to Wingfoot Corporation.

Canadian

Dissolving dimethylol urea in an alkyd resin. No. 446,823. American Cyanamid Co. (Herbert J. West.)

Formed article from about 85% to 65% by weight of set hydrated alpha gypsum and about 15% to 35% by weight of a cured aminotriazine-aldehyde condensation product. No. 446,843. United States Gypsum Co., Canadian Gypsum Co., Ltd. (Manuel C. Dailey, Edward W. Duffy.)

Composition comprising calcium sulfate hemihydrate and a water-soluble curable aminotriazine-aldehyde condensation product. No. 446,844. United States Gypsum Co., Canadian Gypsum Co., Ltd. (Manual C. Dailey, Edward W. Duffy.)

Polymerization of at least one unsaturated organic compound which contains a $CH_2{=}C<$ group in aqueous emulsion in the presence of a catalyst comprising a water-soluble heavy metal salt combined with a derivative of a phosphorus oxyacid. No. 446,863. The B. F. Goodrich Co. (William D. Stewart.)

Compounding polyvinyl chloride with a mixture of dioctyl alkenyl succinates. No. 446,959. Allied Chemical & Dye Corp. (Leslie T. Sutherland.)

The resinous reaction product of (1) a chlorinated acetamide and (2) a product of partial reaction under alkaline conditions of ingredients including a carbomethoxyanilino diamino s-triazine and formaldehyde. No. 446,981. Canadian General Electric Co., Ltd. (Gaetano F. D'Alelio, James W. Underwood.)

A magnetic core material comprising particles of powdered magnetic material bonded together by a polymerized alcohol ester of carboxylic acid. No. 446,984. Canadian General Electric Co., Ltd. (Armin F. Mittermaier.)

Making a laminated article and curing an adhesive bond within the interior. No. 447,085. (Horace W. Hall.)

Preparing a heat-convertible moulding composition in the form of a coagulated plastic product capable of being directly moulded under heat and pressure from a heat-convertible one-stage phenol-formaldehyde resinous product. No. 447,148. Haveg Corp. (William H. Adams, Jr.)

Resinous composition comprising the product of reaction of ingredients including melamine, formaldehyde and a sulfamylphenylaminomethyl melamine. No. 447,230. Canadian General Electric Co., Ltd. (Gaetano F. D'Alelio.)

Resinous composition obtained by heating a linear polyamide forming, composition comprising a primarily diamine-dicarboxylic salt, a monohydric alcohol, formaldehyde, and material selected from the group consisting of urea, guanidine and an amino triazine. No. 447,239. Canadian Industries Limited. (Donald Edwards Edgar.)

Apparatus for the polymerization of an ethenoid monomer in suspension. No. 447,240. Canadian Industries Limited. (Barnard Mitchell Marks.)

Improving the physical properties of organic diisocyanate modified polyesters and polyesteramides by mechanically working said compounds whilst in a plastic condition. No. 447,241. Canadian Industries Limited. (David Augustine Harper.)

Composition comprising one part by weight of polyvinyl alcohol on the dry basis and about from ½ to 4 parts of a clay substantially identical with Chicora No. 3. No. 447,243. Canadian Industries Ltd. (Charles Jules Krister, Henry Joseph Sedusky, George Leonard Thompson.)

Plastic composition adapted to harden on exposure to air, comprising an organic polymeric binder and a finely divided, inert, organic material. No. 447,244. Canadian Industries, Ltd. (Charles William Johnson.)

Subjecting a polymerizable material consisting of at least one unsaturated organic compound to polymerization in aqueous emulsion in the presence of a catalyst comprising a water-soluble heavy metal salt combined with an aliphatic organic compound containing at least one but not more than two divalent sulphur atoms. No. 447,283. The B. F. Goodrich Co. (William D. Stewart.)

Polymerizing a butadiene hydrocarbon in the presence of a compound containing the 2-thiothiazyl group. No. 447,284. The B. F. Goodrich Co. (Charles F. Fryling.)

Plastic composition comprising ethyl cellulose and a phenol as a stabiliser. No. 447,292. Hercules Powder Co. (William Walter Koch.)

Poymerizing ethylene by subjecting it to the action of reduced cobalt deposited on activated carbon. No. 447,322. Shell Development Co. (John Anderson, Walter H. Peterson, Sumner H. McAllister.)

*Processes and Methods

Method and apparatus for catalytic reactions. No. 2,432,934. John P. Rasor to Filtrol Corporation.

Cyclic process involving plurality of converters containing contact material used on stream to obtained desired product, etc. No. 2,433,345. Leland W. T. Cummings to Houdry Process Corporation.

Separating constituents of ternary gaseous mixtures by liquefaction and rectification. No. 2,433,508. Wolcott Dennis to Air Reduction Company, Inc.

Apparatus for treating solid materials in particle form with liquid. No. 2,433,553. Clifford I. Haney and John Gordon Mitchell to Celanese Corporation of America.

Device for grading articles by weight. No. 2,433,575. Herbert O. Niederer and Otto C. Niederer.

Separating constituents of compressed gaseous mixture by liquefaction and rectification. No. 2,433,604. Wolcott Dennis to Air Reduction Company, Inc.

Catalytic reaction apparatus for carrying out catalytic reactions of hydrocarbon gases and for regeneration of catalyst by oxygen-containing gas. No. 2,433,670. Einar Kropp to The Standard Oil Company.

Apparatus for contacting fluids with subdivided solids. No. 2,433,726. Charles H. Angell to Universal Oil Products Company.

Separating suspended matter from stream of gas by centrifugal action. No. 2,433,774. Frederick J. Madely to Western Precipitation Corporation.

Method and apparatus for contacting gases with particle form solid. No. 2,434,202. Louis P. Evans, Charles V. Hornberg and Frederick E. Ray to Socony-Vacuum Oil Company, Incorporated.

Canadian

Means of discriminating between gaseous and liquid phases in apparatus for regulating the venting of effluent through a conduit extending from a processing container evolving a normally gaseous effluent. No. 446,979. The Bristol Co. (Robert D. Cowherd.)

In an extraction process wherein mercaptans of different degrees of ease of transference contained in a hydrocarbon oil are extracted, the improvement comprising fractionally distilling the hydrocarbon oil to produce several fractions containing mercaptans of different degrees of ease of transference. No. 447,056. Shell Development Co. (Albert V. Caselli, Alan C. Nixon.)

Manufacture of crystalline molecular sieve absorbents by the hydrothermal alteration of mordenite. No. 447,074. (Richard Maling Barrer.)

A continuous process of carbonization wherein carbonizable material is advanced in a progressive path through a carbonizing chamber in the form of a relatively thin bed, air is supplied to the bed and volatile constituents of the material are burned selectively at least partially within the bed to supply the heat of carbonization. No. 447,170. Shawinigan Chemicals Limited. (Arthur Hoijord Andersen, Norman Rothwell Fasken.)

In a pump structure, a housing, a reaction member disposed within said housing, a rotor having radial bores disposed within said housing, a plunger in each bore, an axle extending transverse to the direction of rotation of the rotor for each plunger. No. 447,172. Superdraulic Corp. (James F. Hoffer.)

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*U.S. Patents from Vol. 606, Nos. 1, 2, 3, 4.
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*Rubber

Continuously stripping unpolymerized unsaturated materials from latex. No. 2,433,060. Ernest O Ohsol and Wendell W. Waterman to Standard Oil Development Company.

Reclaiming vulcanized rubber. No. 2,433,179. Glynn P. Wheeler to The B. F. Goodrich Company.

Rubber material selected from natural rubber, synthetic rubber prepared by polymerizing 1,3-butadiene, and synthetic rubber prepared by copolymerizing 1,3-butadiene with unsaturated compound polymerizable therewith. No. 2,433,595. Arthur W. Campbell to Commercial Solvents Corporation.

Dispersing rubber in polar organic liquid medium non-solvent for rubber. No. 2,433,656. Charles H. Egan, Arthur J. Leydon and Joseph P. Fahey to Dewey and Almy Chemical Company.

Making rubber article, comprises producing shaped body of non-porous unvulcanized rubber applying coating of latex foam, collapsing foam, drying and vulcanizing rubber article. No. 2,434,035. Wallace W. DeLaney and Cornelius J. Crowley to The Seamless Rubber Company.

Vulcanizing sulfur vulcanizable copolymer of butadiene-1,3 hydrocarbon and organic nitrile copolymerizable. No. 2,434,129. Monte C. Throdahl to Monsanto Chemical Company.

Rubber tread surface comprising irregularly shaped wood chunks and cured rubber matrix. No. 2,434,207. Clarence A. Gapen and Lonnie Gapen.

Canadian

A material comprising a fabric backing, a layer of vulcanized rubber, a vulcanized film over said rubber layer like polymer and being substantially immune to moisture, oils and fats. No. 447,005. Dominion Rubber Co., Ltd. (Dale E. Lovell.)

Composite products of rubber and rayon. No. 447,014. Dunlop Tire and Rubber Goods Co., Ltd. (James William Illingworth, Evelyn William Madge.)

Composition of matter comprising a vulcanizable elastomer from the group consisting (1) natural rubber (2) the synthetic polymers of conjugated diolefinic hydrocarbons, (3) the polymeric haloprenes and (4) the polymeric condensation products of organic dihalides and alkali metal polysulphides and, as a modifier therefor, a linear polyester of sebacic acid and a 1,2-propylene glycol. No. 447,049. The Resinous Products & Chemical Co. (Richard F. Conyne, Frank G. Felske.)

Process of softening a rubber-like chloroprene polymer with a salt of dialkyldithiophosphoric acid and a salt-forming organic base. No. 447,118. American Cyanamid Co. (Arnold Rogers Davis.)

A rubber composition stabilized against oxidation by a natural antioxidant-containing material prepared by contacting a substance selected from the group consisting of crude vegetable and fish oils and vegetable and fish oil-bearing solids. No. 447,157. National Oil Products Company. (Loran O. Buxton.)

Rubber having incorporated therein a reinforcing pigment and a small proportion of a vulcanization accelerator of the group consisting of 2-mercaptothiazoline and substituted 2-mercapto-thiazolines. No. 447,236. Canadian Industries Ltd. (Arthur Morrill Neal.)

Mixing in a butadiene-styrene elastomer a compound of the group consisting of para-nitrosodimethylaniline, nitroso-beta-naphthol, phenylhydrazine, benzoyl peroxide and thio-alpha-naphthol, and exposing the mixture to oxygen. No. 447,246. Canadian Industries Ltd. (John Richard Vincent.)

*Specialties

Adhesive bandage comprising, adhesive strip, gauze pad impregnated with ointment, etc. No. 2,432,541. John McClelland Peck.

Smoke screen composition comprising mineral lubricating oil, inorganic volatile ammonium salt. No. 2,432,577. Harold A. Levey and Alonzo C. Patterson.

Mineral oil comprising petroleum lubricating oil and ortho-ethylphenol. No. 2,432,806. Albert G. Rocchini and Charles Byron Pattinson, Jr. to Gulf Research & Development Company.

Mineral oil comprising petroleum lubricating oil and ortho-cyclohexylphenol. No. 2,432,807. Albert G. Rocchini and Charles Byron Pattinson, Jr., to Gulf Research & Development Company.

Corrosion inhibitors—nitrite salts of primary amines. No. 2,432,839. Aaron Wachter and Nathan Stillman to Shell Development Company.

Rust inhibiting oil comprising oil, alkali metal salt of nitrophenol and solvent. No. 2,432,901. Sven Christian Johansson.

Water-resistant gypsum composition comprising set mass of interlaced gypsum crystals coated with petroleum base asphalt containing paraffin wax. No. 2,432,963. Thomas P. Camp to United States Gypsum Company.

Fungicidal composition comprising mineral oil solution of 2,4-dinitrophenol thiocyanate containing aromatic hydrocarbon solvent. No. 2,433,106. Albert L. Flenner and Russell A. Kaberg to E. I. du Pont de Nemours & Company.

Induction of toxicity to wood destroying fungi into mixture of petroleum fractions, etc. No. 2,433,363. Jacquelin E. Harvey, Jr., Robert H. White, Jr. & Joseph A. Vaughan to Jacquelin E. Harvey, Jr. & Southern Wood Preserving Company.

Induction of toxicity to wood destroying fungi into mixture of petroleum fractions, etc. No. 2,433,364. Jacquelin E. Harvey, Jr., Robert H. White, Jr. & Joseph A. Vaughan to Jacquelin E. Harvey Jr. and Southern Wood Preserving Company.

Induction of toxicity to wood destroying fungi into mixture of petroleum fractions, etc. No. 2,433,365. Jacquelin E. Harvey, Jr., Robert H. White, Jr. & Joseph A. Vaughan to Jacquelin E. Harvey Jr. and Southern Wood Preserving Company.

Composition for removing paint, varnish, enamel and like, comprising methylene chloride, cyclohexylamine, water and methyl cellulose. No. 2,433,517. Lester E. Kuentzel to Wyandotte Chemicals Corporation.

Corrosion preventive composition comprising, alkali salt of sulfonated degras, alkali salt of oil-soluble petroleum sulfonic acids, unsaponifiable oxidized petroleum stock and volatile solvent. No. 2,433,572. Paul R. McCarthy and Elliott S. Francis to Gulf Research & Development Company.

Flour bleaching composition. No. 2,433,611. Bert Dee Ingels to Novadel-Agene Corporation.

Bleaching and maturing flour comprises subjecting flour to action of

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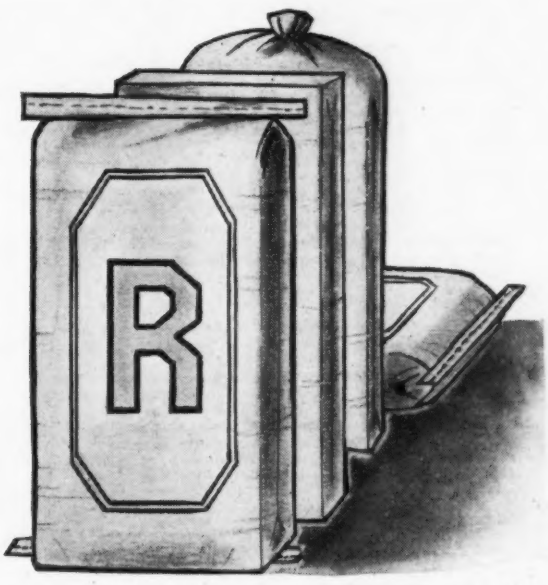

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carbon tetrachloride. No. 2,433,612. Bert Dee Ingels to Novadel-Agene Corporation.

Making soluble oil comprises treating mixture of naphthenic acids and untreated lubricating oil with sulfonating agent, neutralizing stock with alkali metal hydroxide. No. 2,433,646. Philip L. Carter and Walter J. Coppock to Sun Oil Company.

Composition for smoothing zinc surfaces comprising aqueous solution of glacial acetic acid, sulfuric acid, and chromium trioxide. No. 2,433,723. Theophil J. Wieczorek.

Forming cork substitute comprising dispersing gelatin in water, mixing paraffin, glycerine, glycose syrup, minute cell-containing particles of comminuted, pithy, natural cellulosic material, and saponin, agitating, etc. No. 2,433,849. Elbert C. Lathrop and Samuel I. Aronovsky to The United States of America.

Pour point depressant. No. 2,433,851. Eugene Lieber to Standard Oil Development Company.

Lubricant comprising oil of lubricating viscosity, halogen-bearing sulfurized ester of phenol and unsaturated organic acid. No. 2,433,853. Bert H. Lincoln and Waldo L. Steiner to The Lubri-Zol Development Corporation.

Anhydrous, high temperature reversible grease composition comprising mineral lubricating oil and soap. No. 2,433,861. George M. McNulty and John C. Zimmer to Standard Oil Development Company.

Dental impression composition comprising lead silicate, alkali metal alginate, aluminum fluosilicate (silicofluoride) and tetrasodium pyrophosphate. 2,434,005. Stanley E. Noyes.

Canadian

Anti-seize paste for sealing threaded joints comprising a mineral oil and fused lead stearate. No. 447,042. The Parker Appliance Co. (Arthur L. Parker.)

Liquid lubricating oil comprising a petroleum lubricating oil and the calcium salt of an alkyl ester of salicylic acid. No. 447,056. Sinclair Refining Co. (Willard L. Finley.)

Lubricating oil comprising mineral lubricating oil and a minor proportion of oil-soluble mixed green acid soaps and mahogany acid soaps. No. 447,060. Union Oil Company of California. (Earl Arnott.)

A drawing compound comprising an intimate mixture of a higher fatty acid and a product of vulcanization of a high viscosity fatty oil other than marine oils. No. 447,064. (Harley Montgomery.)

*Textiles

Manufacturing synthetic proteinaceous fiber. No. 2,432,776. Leon Lis and Ralph Horton to Aralac, Inc.

Porous, fibrous, cementitious composition of low density. No. 2,432,971. Kenneth S. Ruthman and Joseph R. Parsons to United States Gypsum Company.

Production of filaments and fabrics from fluids. No. 2,433,000. Fred W. Manning.

Colored fibrous glass. No. 2,433,292. Jack W. Perloff to Owens-Corning Fiberglas Corporation.

Artificial bristle, a stiff, smooth-walled thermoplastic filament. No. 2,433,325. Charles E. Slaughter to Extruded Plastics, Inc.

Treating fibers of vegetable origin prior to bleaching. No. 2,433,370. Hans O. Kauffmann, Robert L. McEwen, Edward S. Shanley and John E. Hopkins to Buffalo Electro-Chemical Company, Inc.

Treating starch-sized fabric composed of cellulose acetate and regenerated cellulose staple fibers to remove size and improve resistance to creasing. No. 2,433,620. Richard P. Monsaert to United Merchants & Manufacturers, Inc.

Manufacture of viscose rayon. No. 2,433,733. Alfred S. Brown to Skenandoa Rayon Corporation.

Cellulose acetate fabrics colored with dyestuffs which fluoresce under excitation of ultra-violet light and are fast to washing. No. 2,433,939. George C. Ward and Victor S. Salvin to Celanese Corporation of America.

Textile printing. No. 2,434,013. William C. Ross to Dewey and Almy Chemical Company.

Making elastic fabrics. No. 2,434,111. Thomas G. Hawley, Jr. and Nicolai Timenes to United States Rubber Company.

Dyeing basic nitrogenous fibers with chromium complexes of azo dyestuffs having formula described in patent. No. 2,434,173. Neil Mitchill Mackenzie and Max Emerson Nestler to American Cyanamid Company.

Canadian

Treatment of textiles and other materials containing reactive hydrogen atoms by reacting them with a poly-ketone. No. 446,918. (Claude George Bonard.)

Impregnating cellulosic textile materials with a water-soluble methylated methylol-melamine. No. 446,963. American Cyanamid Co. (Harold W. Stiegler, Linton A. Fluck, Jr.)

In a process for the treatment of filamentary materials having the step of incorporating uniformly throughout the mass of the filamentary materials a polymerized ethylene oxide. No. 447,063. Camille Dreyfus (Richard R. Sitzler, Joseph E. Bludworth.)

*Water, Sewage and Sanitation

Treating water for use in boiler. No. 2,433,167. George W. Smith to Hall Laboratories, Inc.

Canadian

Chlorination apparatus for water supply. No. 446,798. (Norman Mindham Bell, Wilfrid Charles Childs.)

Water softening apparatus. No. 446,989. Canadian Westinghouse Co., Ltd. (Homer J. Shafer.)

Electrolytic water purifier. No. 447,205. (Theodore Charles Jones.)

Agricultural

Substituted nitro aromatic amines as insecticides. No. 2,434,564. William F. Hester and W. E. Craig (to Rohm & Haas Co.)

Insecticidal and bactericidal products 10 eta, 10 eta, 10 eta-trihalo-alpha, alpha-bis (2-hydroxy-3-alkyl-5-tt-octyl-phenyl) ethanes. No. 2,435,016. Charles A. Pitts (to Halliburton Oil Well Cementing Co.)

Stabilizing barium polysulphide for insecticidal, fungicidal and like agricultural purposes. No. 2,435,145. Andre Lalande (to Produits Chimiques de Ribecourt.)

Oxygen warning system. No. 2,435,181. Harold W. Lindsay (to United States of America.)

Killing trees and shrubs, includes applying herbicide ethylene bromide. No. 2,435,204. John H. Davidson (to Dow Chemical Co.)

Controlling insects comprises supplying environment with compound of the formula described in patent. No. 2,435,274. William F. Hester (to Rohm & Haas Co.)

Treatment of higher plants to protect them against pests and fungi comprises applying to organs of plants cationic isoquinolinium. No. 2,435,458. Hugh M. Mosher and Frank L. Howard (to Onyx Oil & Chemical Co.)

Fungicidal composition and improvements in propagating plants. No. 2,435,499. Elbert C. Ladd (to U. S. Rubber Co.)

Fungicidal preparation comprising aqueous suspension of 2, 3-epoxy-1, 2,3,4-tetrahydronaphthalenedione-1,4 containing dispersing agent. No. 2,435,500. Elbert C. Ladd (to U. S. Rubber Co.)

Fungicidal preparation comprising acenaphthenedione in aqueous suspension containing dispersing agent. No. 2,435,501. Elbert C. Ladd (to U S. Rubber Co.)

Biochemical

Separating chlorophyll and impurities associated with chlorophyll as recovered from natural sources. No. 2,434,649. Benjamin Gruskin (to Lakeland Foundation.)

A 3-thioenol ether of an androstene-3-one-17-ol which contains in 17-position member selected from group of saturated and unsaturated hydrocarbon radicals. No. 2,435,013. Karl Miescher (to Ciba Pharmaceutical Products Inc.)

Cellulose

Improving properties of rope composed of filaments of regenerated cellulose of tenacity at least 2 grams per denier. No. 2,434,912. Henry Dreyfus, Donald Finlayson and Richard Gilbert Perry (Celanese Corp. of America.)

Canadian

Treatment of cellulose acetate materials to produce saponified cellulose acetate materials by an aqueous saponifying medium containing an alkali-metal hydroxide as the sole saponifying agent present, formaldehyde and an inorganic salt. No. 447,485. George W. Seymour (to Camille Dreyfus.)

Cellulosic ethers or cellulosic esters and a plasticizer containing a carboxylic acid diester of dihydroxy methyl butane. No. 447,741. Frank John Soday (to The United Gas Improvement Co.)

Ceramics

Forming ceramic bodies. No. 2,434,271. Glenn N. Howatt.

Forming clear homogeneous glasses from glass batch including ingredients that, when heated, give off volatile by-products. No. 2,434,281. Harold R. Moulton (to American Optical Co.)

Forming phosphate glass containing silica. No. 2,434,303. Woldemar A. Weyl (to American Optical Co.)

Making a refractory article of predetermined size and shape. No. 2,434,451. Leslie W. Austin (to The Permanente Metals Corp.)

Canadian

Refractory concrete comprising calcium silicate cement from 5 to 60 per cent and topaz containing at least 1 per cent by weight of fluorine. No. 447,742. Daniel W. Kocher (to Atlas Lumnite Cement Co.)

Coatings

Steel base and anti-fouling protective coating comprising film forming component and phenyl mercury phthalate. No. 2,434,291. Howard E. Smith (Insl-X Corp.)

Dyes, Pigments

Trisazo dyestuffs capable of being developed on fibre. No. 2,434,410. Alfred Jenny and Alex Pedolin (to J. R. Geigy A. G.)

Metallizable azo dyes containing pyrazolone radical. No. 2,435,182. Robert Sidney Long and Charles Edward Lewis (to American Cyanamid Co.)

Metal-Phthalocyanines containing halo-methyl groups. No. 2,435,307. Norman Hulton Haddock, Clifford Wood (to Imperial Chemical Industries Ltd.)

Trisazo urea dyestuffs. No. 2,435,356. Otto Kaiser (to Chemical Industry in Basle.)

Canadian

Pad dyeing to produce a solid colour effect. No. 447,403. Harley Y. Jennings (to Copeman Laboratories Co.)

Dyeing wool with acid, chrome or motallised dyestuffs wherein orthophosphoric acid is added. No. 447,654. Edgar Irvine Noble.

Manufacture of a polyazo dyestuff capable of being coppered, consisting in coupling tetrazotized 4:4'-diamino-3'-dimethoxydiphenyl with one molecule of the monoazo dyestuff obtained by coupling diazotized 5-nitroanthranilic acid with 2-amino-5-hydroxynaphthalene-7-sulphonic acid and one molecule of salicylic acid. No. 447,827. Adolf Krebser, Werner Bossard and Peter Hindermann (J. R. Geigy.)

Equipment

Viscosity measuring apparatus. No. 2,434,349. Theodore A. Cohen (to Wheelco Instruments Co.)

Device for cleaning filters. No. 2,434,427. Jacques Muller.

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Manufacture of a heat-and moisture-resistant duct for transmission of gases and vapors. No. 2,434,465. Henri M. Marc (to The Philip Carey Manufacturing Co.)

Machine for producing asbestos-cement pipes. No. 434,690. John Ferla (to Paul X. Blaettler and U. S. Asbestos Cement Pipe Co.)

Gas compressor. No. 2,434,705. Francis Lago (to Henry W. Jarrett and Philip H. Sellew.)

Instrument for measurement of sample of fluid. No. 2,434,723. Ellen L. Shook.

Controlling viscosity and flow of fluids. No. 2,434,798. Cecil Cyprian Higgens (to The Eyre Smelting Co., Ltd.)

Viscosity-responsive valve. No. 2,434,799. Cecil Cyprian Higgens (to The Eyre Smelting Co., Ltd.)

Device for storing liquid oxygen and controlling conversion into gas phase oxygen. No. 2,434,956. Spencer S. Prentiss (to the United States of America.)

Apparatus for heat exchange between gas and liquid. No. 2,434,976. Teynham Woodward, Arthur W. Vettel and Henry F. Scandrett (to The Permanente Metals Corp.).

Non-metallic filter pack. No. 2,435,115. Samuel Alsop.

Device for protection of wearer against dust. No. 2,435,167. Robert S. Stetson (to Allied Chemical & Dye Corp.)

Flickering beam spectrophotometer for measurement of bronze. No. 2,435,175. George L. Buc, Edwin I. Stearns, (to American Cyanamid Co.)

Flickering beam spectrophotometer for measurement of bronze. No. 2,435,176. George L. Buc, Edwin I. Stearns (to American Cyanamid Co.)

Continuous vacuum filter. No. 2,435,235. Charles L. Porter.

Canadian

Rotary motor or pump for fluids. No. 447,358. George Henry Humphreys.

A method of operating heat exchangers with two separate channel systems in heat exchange relation comprising the steps of passing a heat exchanging fluid through each channel system, directing the flow of each heat exchanging fluid alternately through another one of the channel systems, and turning over the heat exchanger at suitable intervals so as to cause its top and bottom portions to change places. No. 447,378. Carl Johan Lockman (to Aktiebolaget Rosenblads Patenter).

An extended surface element of heat conducting material for a tubular member of a heat exchange device. No. 447,417. Martin Frisch and John Blizard (to Foster Wheeler Corp.).

Crusher. No. 447,438. John T. Fowler (to The Jeffrey Manufacturing Co., Ltd.).

Method of controlling fluid flow. No. 447,470. Prentiss Lobdell (to Standard Oil Development Co.) .

Rubber-tube pump. No. 447,505. Reginald Clarence Ford.

Acetylene generator. No. 447,555. Jean La Force (to Dominion Oxygen Co., Ltd.).

Reciprocatory pump. No. 447,576. Richard Joseph Ifield (to Joseph Lucas Ltd.).

Acetylene generator. No. 447,598. Carl F. Smith (to The Sight Feed Generator Co.).

Apparatus for reactions requiring short contact time using fluid catalyst. No. 447,602. Bruno E. Roetheli and Walter G. Scharmann (to Standard Oil Development Co.).

Sleeve joint for tubes, rods and the like. No. 447,603. Ernest McMinn to Stewarts and Lloyd Ltd.).

Valve mechanism. No. 447,608. John E. Collins and Charles K. Morton (to Valvair Corp.).

Means for delivering the vapours of a tetra-silane derivative to the jet nozzle of ejector and condensation pump. No. 447,688. James Baxter (to Distillation Products, Inc.).

Centrifugal pump with sealing device. No. 447,709. Elof Malmvik (to Jonkopings Mekaniska Werkstads Aktiebolag).

Apparatus for the disposition of flue dust. No. 447,752. Thorleif Thorsten, John Edward Geue and Rolland Francis Kellogg, Sr.

Controlling liquid level in a tank by varying a liquid flow affecting said level. No. 447,826. Clesson E. Mason (to Foxboro Co.).

Regulating valve for governing fluid flow on a quantity basis which is substantially linear with valve lift. No. 447,840. Alfred C. D'Arcey (to Mason-Neilan Regulator Co.).

Filtering apparatus. No. 447,865. George Martin Booth (Wallace & Tiernan Co., Inc.).

Explosives

Combustible explosive charge in compact form for generation of gas pressure. No. 2,434,872. James Taylor, John Whetstone (to Imperial Chemical Industries Ltd.).

Producing Cyclonite. No. 2,434,879. George F. Wright, Douglas C. Downing (to The Honorary Advisory Council for Scientific and Industrial Research).

Blasting cartridge. No. 2,435,116. Frank H. Armstrong (to Armstrong Coal Break Co.).

Food

Preparing protein hydrolysate free of glutamic acid. No. 2,434,715. Harold S. Olcott, James C. Lewis (to the United States of America).

Separating wheat gluten from wheat starch and extracting diastase from wheat grain products. No. 2,434,874. Irwin W. Tucker, Arnold K. Balls (to the United States of America).

Purification of crude tryptophane containing sulphur and iron compound as impurities. No. 2,435,125. Edgar C. Britton and John E. Livak (to The Dow Chemical Co.).

Producing novel sugar compositions having maple flavor and capable of manufacture into fruit type jelly without addition of fruit flavors. No. 2,435,248. Alexander M. Zenzes (to Musher Foundation Inc.).

Producing concentrated sugar base composition, capable of use as table syrup and manufacture of fruit flavored syrups and jellies. No. 2,435,249. Alexander M. Zenzes (to Musher Foundation, Inc.).

Canadian

Peeling guar. No. 447,563. Paul E. Ramstad and Kenneth J. Young and John A. Esser (to General Mills, Inc.)

Inorganic

Concentrating dilute aqueous solution of ammonium metal salt complex without deposition of insoluble decomposition products. No. 2,434,402. Alfred W. Fleer (to Shell Development Co.).

Preparation of magnesium silicate adsorbents. No. 2,434,418. William A. La Lande, Jr. (to Attapulgus Clay Co.).

Regenerating solid adsorbent containing moisture adsorbed from wet combustible gas. No. 2,434,419. Carl D. Laughlin and Harry M. Gwyn, Jr. (to Attapulgus Clay Co.).

Leakproof cell comprising zinc can forming electrode, carbon electrode arranged in can, outer metallic container surrounding zinc can, a jacket of insulating material. No. 2,434,703. Morris D. Koppelman (to Olin Industries, Inc.).

Treating alkaline earth compound selected from the group consisting of oxide and hydrate. No. 2,434,710. Leonard John Minnick (to G. & W. H. Corson, Inc.).

Sheet electrode for electrochemical processes. No. 2,434,731. Alexander E. zu Eltz (to Baker & Co., Inc.).

Fluorescent material consisting of calcium cadmium molybdate. No. 2,434,764. Herman C. Froelich, Ann R. Hersey (to General Electric Co.).

Producing concentrated ammonium salt. No. 2,434,899. James D. Biggs (to The Military Chemical Works, Inc.).

Coating with tungsten carbide. No. 2,435,273. Henry Stafford Hatfield.

Preparing catalyst of mixed sulfides, and a metal of iron-group. No. 2,435,380. Raymond C. Archibald and Robert A. Trimble (to Shell Development Co.).

Production of briquettes from finely divided material consisting essentially of magnesia. No. 2,435,495. John Parsons (to Dominion Magnesium Limited).

Canadian

Forming sodium sulphate and hydrochloric acid, using the sodium sulphate in the sulphate cellulose process and reacting the hydrochloric acid with the calcium carbonate-containing waste product to form calcium chloride. No. 447,489. Gosta Yngve Schotte and Hans Evert Otto Nordin.

Removing silica from an alumina enriched alkali metal aluminate solution comprising adding a light magnesium oxide. No. 447,582. Frederick Ratcliffe Archibald (to Nepheline Products Ltd.)

Sintered hard composition of aluminium oxide and at least one of the elements tungsten, molybdenum, tantalum, rhenium, osmium, ruthenium, irridium, and boron. No. 447,641. Sydney Francis Weeton.

Making an electrolyte member for dry primary cells by heating a concentrated alkali metal hydroxide electrolyte. No. 447,658. Samuel Ruben.

Improving luminescent material by adding the luminescent material to a solution of a silicate salt, and thereafter precipitating silica upon the added luminescent material. No. 447,823. Ronald Puleston and Stanley Thomas Henderson (to Electric & Musical Industries, Ltd.).

Medicinal

Manufacture of alkali metal ascorbates of crystalline character. No. 2,434,625. Simon L. Ruskin (to Frances R. Ruskin).

Pharmaceutical product for treatment and prevention of motion sickness. No. 2,434,635. Llewellyn L. Barrow.

Producing vitamin A active esters. No. 2,434,687. Norris D. Embree and Edgar M. Shantz (to Distillation Products, Inc.).

Producing fat-soluble vitamin concentrate from fat-soluble vitamin-containing marine oil. No. 2,434,788. Loran O. Buxton (to Nopco Chemical Co.).

Separating vitamin alcohols from vitamin esters. No. 2,434,789. Loran O. Buxton (to Nopco Chemical Co.).

Manufacture of saturated and unsaturated compounds of etio-cholanic acid series. No. 2,435,017. Tadeus Reichstein (to Ciba Pharmaceutical Products Inc.).

Amino Arsenicals. No. 2,435,392. Cliff Struthers Hamilton (to Parke Davis & Co.).

Arsenic Derivatives. No. 2.435.393. Cliff Struthers Hamilton and Clarence Kenneth Banks (to Parke Davis & Co.).

Production of tryptophane from 3-indole aldehyde and hydantoin. No. 2,435,399. John E. Livak and Maxton F. Murray (to Dow Chemical Co.).

Metals, Ores

Treating tin-containing materials. No. 2,434,283. Irving E. Muskat (to Vulcan Detinning Co.).

Treating tin-containing materials. No. 2,434,284. Irving E. Muskat (to Vulcan Detinning Co.).

Electrolytic tin plate. No. 2,434,290. Harry S. Schutte (to Carnegie-Illinois Steel Corp.).

Removal of fine dust from bauxite. No. 2,434,389. Ferdinand W. Breth and Anthony Kinsel (to L. Sonneborn Sons, Inc.).

Producing integral corrosion-resistant coating on zinc, cadmium or copper. No. 2,434,525. Robert M. Thomas, Charles W. Ostrander and Walter H. Kaelin (to Rheem Manufacturing Co.).

Recovering metal values from ores of Mayari type. No. 2,435,304. Charles V. Foerster, Arthur T. Cape (to Coast Reduction Inc.).

Treating marmatitic zinc sulphide ores and concentrates. No. 2,435,340. Niels C. Christensen (to Combined Metals Reduction Co.).

Remetallizing selected area of very thin paper upon which there has been previously deposited extremely thin layer of metal. No. 2,435,441. Richard Alfred Grouse (to A. H. Hunt Ltd.).

Making smooth and bright deposits of silver of substantial thickness comprises electrodepositing silver from plating bath. No. 2,435,527. Joseph S. Williams and Walter R. Binai (to P. R. Mallory & Co., Inc.).

Canadian

Recovery of light metal from a fused salt bath more dense than the metal recovered comprises collecting crude hot metal in the bath, passing the crude hot metal upward in a stream into a body of metal above the bath, cooling the crude hot metal in the body of metal to a point where dissolved impurities are precipitated. No. 447,364. Robert Joseph McNitt.

In the electrolysis of fused baths in a cell having a cathode, an anode, a diaphragm, and a cathode stream of electrolyte circulating in the bath in the form of a loop. No. 447,365. Robert J. McNitt.

Flotation for mineral separation. No. 447,519. Francis Bice Michell.

Electrodepositing indium. No. 447,536. Thomas Richards Jones and Nevin Richard Bierly (to The American Metal Co., Ltd.).

Producing magnesium from magnesium silicate ores. No. 447,583. Fritz J. Hansgirg (to North Carolina Magnesium Development Corp.).

Producing metallic magnesium. No. 447,585. Fritz J. Hansgirg (to North Carolina Magnesium Development Corp.).

Electrodeposition of silver. No. 447,714. Walter R. Binai and James J. Monagle (to P. R. Mallory & Co.).

Forming a corrosion resistant coating on magnesium, which comprises electrolytically treating the metal in an alkaline aqueous combined solution containing sodium hydroxide and potassium hydroxide of 5-35 per cent, with sodium hydroxide and potassium hydroxide being in the ratio of 1 to 1, at a temperature range of 90 to 180° F., with current 1 to 220 volts for 15 to 90 minutes, 2-25 amperes per square foot. No. 447,815. Norman H. Simpson and Paul R. Cutter (Consolidated Vultee Aircraft Corp.).

Organic

Synthesis of aldehydes and lactones. No. 2,434,246. Roland Kapp, Frank D. Pickel, Louis T. Rosenberg (to Nopco Chemical Co.).

Manufacturing methyl lactate from crude sodium lactate obtained by concentrating fermentation liquor containing sodium lactate and residual impurities. No. 2,434,300. Samuel M. Weisberg and Edwin G. Stimpson (to National Dairy Research Laboratories, Inc.).

Manufacture of aliphatic dialdehydes. No. 2,434,313. Henry Dreyfus.

Separation of toluene from hydrocarbon fraction of boiling range to 30° F. containing toluene and non-aromatic hydrocarbons. No. 2,434,322. John W. Latchum, Jr., and James S. Connors (to Phillips Petroleum Co.).

Tetra-alkyl carbonyl tetrathio di-phosphates and preparation. No. 2,434,357. Arthur H. Fischer (to Minerec Corp.).

Producing unsaturated alcohol. No. 2,434,394. Harry A. Cheney, Robert Dagley, Jr., and Sumner H. McAllister (to Shell Development Co.).

Production of toluene. No. 2,434,395. William H. Claussen and Thomas M. Powell (to California Research Corp.).

A 2-hydroxy-3, 5-ditertiaryamyl-4'-diethyl aminodiphenyl sulfide. No. 2,434,397. Virgil K. Cooper.

Producing cyclopentadiene. No. 2,434,403. Frederick E. Frey (to Phillips Petroleum Co.).

Producing 2-hydroxymethyl-1, 4-dioxane. No. 2,434,415. Morris S. Kharasch (to Eli Lilly & Co.).

Separating butadiene from C_4 hydrocarbon mixture comprising butadiene, beta butylene and saturated C_4 hydrocarbons. No. 2,434,424. Ruppert C. Morris and Theodore W. Evans (to Shell Development Co.).

Conversion of pentane to isopentane. No. 2,434,437. William E. Ross (to Shell Development Co.)

2-chloro-3-iminobutyronitrile. No. 2,434,507. Jerome L. Mostek (to Sinclair Refining Co.)

Manufacture of tertiary dodecyl mercaptan. No. 2,434,510. John F. Olin. John L. Eaton (to Sharples Chemicals, Inc.)

Producing diolefins. No. 2,434,522. Wilson D. Seyfried. (to Standard Oil Development Co.)

Condensing hydrocyanic acid and acrylonitrile. No. 2,434,606. Erwin L. Carpenter (to American Cyanamid Co.)

Making vanillin. No. 2,434,626. Jorgen Richter Salvesen, David L. Brink, Donald G. Diddams, Peter Owzarski (to Salvo Chemical Corp.)

Hydrolysis of acetone auto-condensation products. No. 2,434,631. De Loss E. Winkler, William J. Raab and Seaver A. Ballard (to Shell Development Co.)

Oxidizing alkali metal salt of dehydroabietic acid. No. 2,434,643. Arthur E. Drake (to Hercules Powder Co.)

Xylidine and amount of carbon disulfide to stabilize xylidine against discoloration during storage. No. 2,434,651. Anthony E. Robertson (to Standard Oil Development Co.)

Purifying modifier rosin. No. 2,434,656. Irvin W. Humphrey (to Hercules Powder Co.)

Preparing modified keratin. No. 2,434,688. Ralph L. Evans.

Refining a mixture of unsaturated acids of the class consisting of higher aliphatic fatty acids, natural resin acids and esters of said acids for removal of color bodies. No. 2,434,699. Ralph H. Huff.

Preparation of organic sulphonic derivatives. No. 2,434,746. John Ross, Dwight James Potter and Seymour Yolles (to Colgate-Palmolive-Peet Co.)

1-amino-2-hydroxyalkylthio-4-arylamino-anthraquinones. No. 2,434,765. Paul Grossman (to Society of Chemical Industry in Basle.)

Glyceryl ether of hydrogenated cardanol. No. 2,434,797. Mortimer T. Harvey (to The Harvel Corp.)

Producing formaldehyde by partial oxidation of gaseous aliphatic hydrocarbons in which preheated gas mixture containing hydrocarbons is oxidized. No. 2,434,850. Carroll A. Hochwalt, Carlyle J. Stehman, Roy W. Sudhoff (to Monsanto Chemical Co.)

Alpha-(3,4-methylenedioxyphenyl) tetrahydropyran. No. 2,434,856. Frederick B. La Forge (to United States of America.)

Removal of carbonyl sulfide from hydrocarbon fluid containing carbonyl sulfide, comprises contacting fluid with aqueous alkaline solution in presence of sodium aluminate. No. 2,434,868. George E. Sample, Walter B. Miller (Shell Development Co.)

Production of peroxidic compounds selected from tertiary butyl hydroperoxide, di(tertiary butyl)-peroxide and mixtures. No. 2,434,888. Frederick F. Rust and John H. Raley (to Shell Development Co.)

Recovering butadiene free from methyl acetylene from hydrocarbon feed containing butadiene methyl acetylene, and butene-2, in same fractionator. No. 2,434,923. Karl H. Hachmuth (to Phillips Petroleum Co.)

Borate of lower-alkylpolysiloxane. No. 2,434,953. Winton I. Patnode (to General Electric Co.)

1-(3-4-diacetoxycyclophenyl)-1,2-diacetoxy-butanone. No. 2,434,981. Joseph E. Bludworth and Donald P. Easter (to Celanese Corp. of America.)

1-(3,4-dihydroxycyclohexyl) -1,2-dihydroxybutanone. No. 2,434,982. Joseph E. Bludworth and Donald P. Easter (to Celanese Corp. of America.)

Production of unsaturated aldehydes. No. 2,435,018. Leopold Ruzicka (to Ciba Pharmaceutical Products Inc.)

roducing isobutylene comprises contacting mono-hydric tertiary butyl phenol with active clay catalyst. No. 2,435,038. William I. Gilbert and Charles W. Montgomery (to Gulf Research & Development Co.)

Amide of sulfolanylamine and a carboxylic acid wherein amide nitrogen atom is directly attached to acyl radical of acid and to nuclear carbon atom in sulfolanylamine. No. 2,435,071. Theodore W. Evans, Rupert C. Morris and Edward C. Shokal (to Shell Development Co.)

Rearrangement of methyl vinyl carbinol to crotyl alcohol, and recovery of latter. No. 2,435,078. George W. Hearne and Donald S. LaFrance (to Shell Development Co.)

Producing 2,4-dimethyl-6-alkyl substituted phenol of high anti-oxidant power from mixture of 2,3-and 2,5-dimethyl phenols. No. 2,435,087. Daniel B. Luten, Jr. and Aldo De Benedictis (to Shell Development Co.)

Stabilizing mixture of fatty acids containing oleic acid and at least 1 polyunsaturated higher fatty acid. No. 2,435,159. John Ross (to Colgate-Palmolive-Peet Co.)

Acylhydrazino amino derivatives. No. 2,435,203. Gaetano F. D'Alelio and James W. Underwood. (General Electric Co.)

Isomerizing a natural fat containing glyceryl esters of oleic acid. No. 2,435,208. William R. Eipper.

Production of thiocarbanilide and its methyl homologs. No. 2,435,295. Henry L. Stasse (to Allied Chemical & Dye Corp.)

Nitrating organic volatile nitratable compound. No. 2,435,314. Vaman R. Kokatnur (to Autoxygen, Inc.)

Organic composition comprising soap. No. 2,435,333. Ellis R. White (to Shell Development Co.)

Preparing cyclohexyl methyl carbinol from butadiene and methyl vinyl ketone. No. 2,435,403. Rupert C. Morris and Theodore W. Evans (to Shell Development Co.)

Production of sulfolane compound. No. 2,435,404. Rupert C. Morris and John L. Van Winkle (to Shell Development Co.)

Separating gem alkyl cyclohexane from with a nongem alkyl cyclohexane. No. 2,435,443. Vladimir N. Ipatieff and Herman Pines (to Universal Oil Products Co.)

Saponifying with caustic soda cottonseed oil refining foots. No. 2,435,456. Herbert K. McClain (to The Procter & Gamble Co.)

Preparing aldehydic material. No. 2,435,460. Charles I. Parrish (to The Pennsylvania Salt Mfg. Co.)

Inhibiting precipitation of lithium soap in aqueous solution of lithium hypochlorite and soap. No. 2,435,474. Edward C. Soule (to The Mathieson Alkali Works, Inc.)

Purifying dithio bis-arylamine produced by reaction of primary arylamine with elemental sulfur. No. 2,435,508. Phillip T. Paul and Lyndon B. Tewksbury, Jr. (to U. S. Rubber Co.)

Preparation of secondary and tetiary ethinyl carbinols by interaction of acetylene hydrocarbon with member of class of aldehydes and ketones. No. 2,435,524. Charles Weizmann (to Polymerisable Products Ltd.)

Refining wax acids. No. 2,435,542. Frederick G. Hess (to Cities Service Oil Co.)

Nitrating organic nitratable compound. No. 2,435,544. Vaman R. Kokatnur (to Autoxygen, Inc.)

Production of mercaptans in presence of silica gel catalyst. No. 2,435,545. Joseph P Lyon, Jr. (to Phillips Petroleum Co.)

Products of acrylonitrile and aryl sulfones. No. 2,435,552. Herman A. Bruson (to The Resinous Products & Chemical Co.)

Dimeric octadecadienonitrile when pure being pale yellow oil having formula $C_{36}H_{56}N_2$. No. 2,435,553. Herman A. Bruson and Warren D. Niederhauser (to The Resinous Products & Chemical Co.)

Canadian

Producing chemical compounds by reacting aliphatic aldehydes containing 1 to 5 carbon atoms in the molecule, with compounds having the general formula: R. CO. (NH.CxH2x)n. NH.CyH2y.OH in which R represents any alkyl or hydroxy-substituted alkyl chain of a fatty acid, containing at least 7 carbon atoms, x and y each represent a number from 2 to 5 inclusive and n represents a number from 0 to 3 inclusive. No. 447,379. Ernst Alfred Mauersberger (to Alframine Corp.)

Recovering the unsaponifiable oxidation products of an oxidation reaction mixture resulting from the liquid-phase controlled partial oxidation of a mixture of petroleum hydrocarbons. No. 447,380. James A. Camelford (to Alox Corp.)

Manufacture of 2-hydroxy carbazole which comprises heating 2-amino-4-hydroxy diphenyl. No. 447,418. William H. von Glahn and Bernard W. Rottschaefer (to General Aniline and Film Corp.)

Method for preparing carboxylic esters of hydroxy-dihydronorpolycyclopentadiene having the acyl group attached through oxygen to one terminal cycle and having a double bond in the opposite terminal cycle. No. 447,461. Herman A. Bruson (to The Resinous Products and Chemical Co.)

A method for preparing hydroxydihydronordicyclopentadiene having a terminal five-membered cycle containing a double bond, which comprises reacting dicyclopentadiene with aqueous sulphuric acid. No. 447,462. Herman A. Bruson (to The Resinous Products and Chemical Co.)

In a process for the production of an acetic acid ester of a cyclic ketal the step which comprises reacting acetic acid with a cyclic ketal from glycerol and an aliphatic ketone containing at least 8 carbon atoms in the presence of hydrochloric acid. No. 447,466. Kenneth E. Marple (to Shell Development Co.)

Melamine by heating a member of the group consisting of cyanamide and dicyandiamide in a solvent comprising liquid ammonia. No. 447,535. Andrews C. Wintringham (to American Cyanamid Co.)

Condensing an alpha-gamma-diacyloxy beta-beta- dimethyl butyryl halide with an alkyl ester of beta-alanine. No. 447,580. Dilwarth Wayne Woolley (to National Oil Products Co.)

Beta-alanine by hydrogenating a lower alkyl ester of cyanoacetic acid. No. 447,581. Kurt Herbert Schaaf and Frank Daniel Pickel (to National Oil Products Co.)

Stabilizing aqueous formaldehyde solutions by adding a compound selected from the group consisting of melamine and alkylol melamines. No. 447,670. Robert C. Swain (to American Cyanamid Co.)

Barium salts of alkyl phenol sulphides from an alkyl phenol sulphide with barium sulphide. No. 447,671. Kenneth D. Ashley and Elmer W. Cook (to American Cyanamid Co.)

Producing 4-chlorophthalic acid. No. 447,672. Frederick C. Schubart (to American Cyanamid Co.)

Alkali aqueous solution, of a mercaptothiazole oxidizing with nitrogen chloride to precipitate the disulphide of the mercaptothiazole. No. 447,689. Moris Goodwin Shepard and William Earl Messer (to Dominion Rubber Co.)

Reaction product of from two to three molecular proportions of an arylenethiazyl sulphur chloride with one molecular proportion of ammonia. No. 447,690. William Earl Messer (to Dominion Rubber Co.)

Preparing "phytol-ketone" by reacting a 4,8,12-trimethyl-tridecyl magnesium halide and acetaldehyde, hydrolyzing the addition product, and oxidizing the resultant carbinol. No. 447,744. Lee Irvin Smith and Joseph A. Sprung (to Regents of the University of Minnesota.)

Preparation of 1,3-diketone which comprises heating an acyl ester of the enolic form of a ketone to a temperature of about 300 to 700°C. to cause said acyl group of the acyl ester to migrate to form a diketone having two carbonyl groups attached to the same aliphatic carbon atom. No. 447,812. Albert B. Boese. Jr. and Frank G. Young, Jr. (to Carbide and Carbon Chemicals Ltd.)

Manufacture of para-aminobenzenesulphonamido-thiazoles, by treating with a hydrolyzing agent a benzenesulphonamido-thiazole-carboxylic acid ester, the benzene nucleus of which is substituted in the para-position by an amino-group or a group convertible into an amino-group, decarbolyzing and converting into an amino group any group so convertible in p-position of the benzene nucleus. No. 447,814. Max Hartmann and Harald von Meyenburg (to Society of Chemical Industry.)

Process of making vanillin by removing sodium vanillate from its alkaline solution in butyl alcohol by eluting said organic solvent with a weak aqueous solution containing 2 to 10 grams per litre of caustic alkali to yield an alkaline aqueous solution containing substantially all the said vanillin salt and practically vanillin-free butyl alcohol suitable for re-use. No. 447,839. Richard Servis (to Marathon Corp.)

Production of cyclohexane from naphthenic petroleum distillates of the nature of gasoline which comprises separating from a fraction by fractional distillation having an initial boiling point below about 70°C. and a final boiling point between about 75°C. and 85°C., containing substantially all of the methyl cyclopentane and hydroforming in the presence of hydrogen with a catalyst molybdenum oxide. No. 447,853. Norman E. Peery (to Shell Development Co.)

Packaging

Apparatus for forming container head from blank of paperboard. No. 2,434,375. Raymond H. Van Saun (to Container Corp. of America.)
Container, side wall consisting of single section cylindrical tubing. No. 2,434,377. Edgar Watson (to The Nelson Co.)
Hermetically sealed fiber container. No. 2,434,756. Lewis C. Brooks (to Ira Milton Jones.)
Bag made of composite material. No. 2,434,892. Frederick A. Ulm (to Arkell Safety Bag Co.)
Paper Bottle. No. 2,435,155. F. D. Palmer (to F. D. Palmer, Inc.)
Collapsible wall type container. No. 2,435,251. Charles A. Tome.
Carton formed of single blank. No. 2,435,283. Stephen Lighter.
Making bags from continuous strip of heat sealable material. No. 2,435,560. Arthur W. Richens (to E. S. & A. Robinson (Canada) Ltd.)

Paints, Pigments

Liquid waterproofing paint comprising calcium chloride, Portland cement, glucose mixed in water. No. 2,434,695. William Helms.

Paper, Pulp

Continuous pulper and selector. No. 2,434,449. Harold Donald Wells.

Canadian

Improving brightness and whiteness of paper by spreading fluorescent hydrocarbon crystals in a continuous film on a calendar roll of a paper mill, and calendering said film onto the surface of newsprint. No. 447,751. Joseph Lyman Switzer and Robert Charles Switzer.

Petroleum

Production of saturated hydrocarbons. No. 2,434,289. Louis Schmerling (to Universal Oil Products Co.)
Paraffin hydrocarbon isomerization. No. 2,434,338. Ernest Solomon (to M. W. Kellogg Co.)
Purifying hydrocarbon mixture containing a small amount of organically combined fluorine compound produced by catalytic alkylation of hydrocarbons in presence of active fluorine catalyst. No. 2,434,409. Vladimir N. Ipatieff and Carl B. Linn (to Universal Oil Products Co.)
Process for production of industrial or power gases. No. 2,434,444. Michael Steinschlaeger.
Treating alkaline petroleum residue obtained by distilling hydrocarbon oil in contact with alkali. No. 2,434,528. Edward F. Wadley (to Standard Oil Development Co.)
Synthesizing hydrocarbons including hydrocarbon oils, by contacting CO and hydrogen at elevated temperatures and pressures with catalyst. No. 2,434,537. Frank T. Barr, Walter G. Scharmann (to Standard Oil Development Co.)
Preparing motor fuel with improved road octane rating and lead susceptibility. No. 2,434,577. Pharis Miller (to Standard Oil Development Co.)
Antiknock motor fuel. No 2,434,578. Pharis Miller (to Standard Oil Development Co.)
Producing gasoline by cracking high sulfur stock containing alkalatable constituents and separating fraction. No. 2,434,623. Jacob R. Meadow and William A. Stover (to Socony-Vacuum Oil Co., Inc.)
Producing improved gasoline. No. 2,434,634. John R. Bates (to Sun Oil Co.)
Motor fuel comprising gasoline hydrocarbons, knock reducing amount of aromatic amine, gum inhibiting amount of alkylated hydroxy aromatic oxidation inhibitor and carbon disulfide. No. 2,434,650. Walter A. Herbst (to Standard Oil Development Co.)
Extractive distillation of C_4 hydrocarbons with furfural. No. 2,434,796. Karl H. Hachmuth (to Phillips Petroleum Co.)
Condensation of hydrocarbons by contact with concentrated sulfuric acid in silica gel. No. 2,434,833. Frank G. Ciapetta (to The Atlantic Refining Co.).
Treating mixture comprising hydrocarbons with aqueous alkaline treating solution of compound selected from group consisting of alkaline alkali metal compounds and alkaline ammonia compounds. No. 2,434,839. Orris L. Davis, Alan C. Nixon (to Shell Development Co.).
Hydrocarbon conversion process. No. 2,434,843. Frank C. Fahnestock, Walter Ullrich (to Socony-Vacuum Oil Co., Inc., and The Lummus Co.)
Alkylation of isoparaffin with olefin in presence of alkylation catalyst. No. 2,435,028. William E. Bradley (to Union Oil Co. of California).
Alkylation of isoparaffins with olefins. No. 2,435,029. William E. Bradley (to Union Oil Co. of California).
Hydrocarbon conversion process. No. 2,435,158. Davis Read, Jr. (to Universal Oil Products Co.).
Cracking hydrocarbon oil heavier than gasoline by contact with beryllium phosphate. No. 2,435,196. George R. Bond, Jr., and George Alexander Mills (to Houdry Process Corp.).
Alkylating saturated tertiary carbon atom-containing hydrocarbon by reaction with an olefinic compound and responding unsaturated chlorides in presence of concentrated sulfuric acid. No. 2,435,402. Sumner H. McAllister and Edwin F. Bullard (to Shell Delevopment Co.).
Preparation of lubricating oil. No. 2,435,483. Richard S. Vose (to Sun Oil Co.).
Production of hydrocarbons from carbon monoxide and hydrogen. No. 2,435,551. James F. Black (to Standard Oil Development Co.).

Canadian

Isomerization of an isomerizable paraffin hydrocarbon. No. 447,475. Vladimir Ipatieff and Herman Pines (to Universal Oil Products Co.).
Hydrogenation of octenes. No. 447,476. Vladimir N. Ipatieff and Ben B. Corson (to Universal Oil Products Co.).
Subjecting hydrocarbon oil at cracking temperature to the action of a calcined mixture of the hydrogels of silica, alumina and zirconia. No. 447,477. Julia Southard Lee and Charles La Mar Thomas.
Fuel comprising mixture of 16 to 30 per cent naphthalene and 3 to 14 per cent of additional hydrocarbons of same low flash point naphthalene, 50 to 83 per cent of coal and 4 to 12 per cent of hydrocarbons of a higher flash point. No. 447,504. Fred Elkan.
Hydrocarbon conversion reactions. No. 447,605. Joseph Davis Danforth (to Universal Oil Products Co.).
Hydrocarbon reactions. No. 447,606. Joseph Davis Danforth (to Universal Oil Products Co.)
Hydrocarbon reactions. No. 447,607. Joseph Davis Danforth (to Universal Oil Products Co.).
Hydrogen fluoride alkylation process. No. 447,743. John O. Iverson (to Universal Oil Products Co.).
Lubricating grease containing a lubricant base and a lead soap of hydroxy-stearic acid. No. 447,835. Harold Milton Fraser (to International Lubricant Corp.).
Hydrocarbon conversion by passing a stream of a carrying fluid through supply of Friedel-Crafts type catalyst under conditions such that only a portion of said catalyst is picked up by and carried in said stream. No. 447,863. Joseph Davis Danforth (Universal Oil Products Co.).

Photographic

Producing colored image in a photographic silver halide layer. No. 2,434,272. Edwin E. Jelley and Paul W. Vittum (to Eastman Kodak Co.).
Apparatus for taking photographs and projecting several partial images to form stereograms. No. 2,434,385. Maurice Bonnet (to Societe La Reliephographie Societe pour l' Exploitation des Procedes de Photographie en Relief).
Making corrected color-separation images for reproduction of colored original by superimposed prints from structured printing plates. No. 2,434,561. Arthur C. Hardy, Edward C. Dench (to Interchemical Corp.).
Photographic silver halide emulsion having incorporated therein, as non-diffusing color forming development component, a compound having formula described in patent. No. 2,435,173. Abraham Bavley (to General Aniline & Film Corp.).
Producing magenta color photographic image in gelatino silver-halide emulsion layer. No. 2,435,550. Abraham Bavley (to General Aniline & Film Corp.).

Canadian

Photographic silver halide emulsion layer having a colour forming development component comprising the reaction product of a salicylaldehyde and a primary alkyl amine. No. 447,560. Abraham Bavley (to General Aniline & Film Corp.).

Polymers

Light Stable Compositions comprising polymeric vinylidene chloride or vinyl chloride and certain 5-substituted 2-hydroxybenzophenones. No. 2,434,496. Thomas Houtman, Jr. (to The Dow Chemical Co.)
Manufacture of thermoplastic materials. No. 2,434,541. John M. Bierer (to Boston Woven Hose and Rubber Co.)
Low temperature polymerization process for polymerization of isobutylene in presence of liquefied paraffinic hydrocarbon internal refrigerant. No. 2,434,552. Norman M. Elmore, Hector C. Evans (to Standard Oil Development Co.).
Plasticizing proteins and products thereof. No. 2,434,906. Richard Paul Carlton and Howard C. Brinker (to Minnesota Mining & Manufacturing Co.).
Polymerizing dehydrated liquid polymers consisting of polymeric diorgano siloxane in which one of the two organic radicals attached to each silicon atom is alkyl radical, and other organic radical is selected from class of alkyl and aryl radicals. No. 2,435,147. Rob Roy McGregor, Earl Leathen (to Corning Glass Works).
Chlorinated dimethyl silicone polymers. No. 2,435,148. Rob Roy McGregor, Earl Leathen (to Corning Glass Works).
Apparatus for producing solid polymers. No. 2,435,228. Matthew D. Mann, Jr., (to Jasco, Inc.).
Kneader polymerization process for olefins. No. 2,435,229. Matthew D. Mann (to Jasco, Inc.)
Removing polyvinyl formal resin coating from copper wire. No. 2,435,239. Robert Ira Schub (to Joe A. Stone).
Composition of matter consisting of solid homopolymer of ethylene and diphenylamine-acetone condensation product. No. 2,435,246. Daniel E. Strain (to E. I. du Pont de Nemours & Co., Inc.).
Producing phosphorus-containing resins. No. 2,435,252. Arthur Dock Fon Toy (to Victor Chemical Works).
Apparatus for extruding plastic materials. No. 2,435,282. Nathan Lester (to Lester Engineering Co.).
Diolefine polymer resins. No. 2,435,411. Frank J. Soday (to The United Gas Improvement Co.).
Plasticized natural resin material. No. 2,435,412. Frank J. Soday (to The United Gas Improvement Co.).
Forming resin comprising reacting 2-(hydroxymethyl)-1- propen-3-ol with dicarboxylic acid anhydride. No. 2,435,429. Theodore W. Evans and David E. Adelson (to Shell Development Co.).
Polyamides from polyoctadecapolyenylamine. No. 2,435,478. Howard M. Teeter and John C. Cowan (to United States of America).
Obtaining orientable polyvinylidene fluoride. No. 2,435,537. Thomas A. Ford and William Edward Hanford (to E. I. du Pont de Nemours Co., Inc.).
Casting and moldable mixture for forming phenolalkyd resin upon heating. 2,435,554. Loring Coes, Jr. (to Norton Co.).
Mixed resin bonded abrasives. No. 2,435,555. Loring Coes, Jr. (to Norton Co.).
Self supporting vinyl chloride-vinylidene chloride copolymer film having resistance to passage of water vapor. No. 2,435,646. Milton R. Radcliffe (to The Firestone Tire & Rubber Co.).

Canadian

Odor stabilized plastic composition by the incorporation in the composition of from about 0.25 per cent to about 5 per cent of the combined weight of vinyl resin and plasticizer of phthalic anhydride. No. 447,400. Lauchlin M. Currie (to Carbide and Carbon Chemicals Ltd.).
A pressure-sensitive adhesive tape comprising a flexible porous paper impregnated and unified by a relatively non-tacky, non-hygroscopic copolymer of vinyl acetate and a neutral ester of an ethylene-alpha-beta-dicarboxylic acid in which at least about half of the carboxylic acid groups are esterified with a saturated beta-alkoxyethanol. No. 447,444. William E. Lundquist and Waldo Kelligren (to Minnesota Mining & Manufacturing Co.).

Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

95,359. Reg. Feb. 10, 1914, The Sinclair Manufacturing Co., Toledo, Ohio, republished by The Sinclair Manufacturing Co., Toledo, Ohio; for chloride of lime, concentrated lye, powdered borax and ammonia; since Oct. 1911.

113,673. Reg. Oct. 31, 1916. Bemis Bro. Bag Company, St. Louis, Mo., republished by registrant; for coated fabrics; since Apr. 15, 1916.

120,597. Reg. Feb. 19, 1918. Liberty Paper Co., New York, N. Y., Republished by Central Paper Co., Menasha, Wis., corporation of Wisconsin; for gummed tape; since Sept. 16, 1915.

153,399. Reg. Mar. 21, 1922. Armor Oil & Chemical Co., Kansas City, Mo., republished by Tnemec Co., Inc., Kansas City, Mo.; for ready-mixed paints; since July 15, 1921.

159,309. Reg. Sept. 26, 1922. Central Paper Co., Menasha, Wis., republished by registrant; for gummed paper; since July, 1918.

181,608. Reg. Mar. 25, 1924, Minnesota Linseed Oil Paint Co., Minneapolis, Minn.; republished by registrant; for semi-paste paints; since Mar. 29, 1922.

188,507. Reg. Aug. 26, 1924, U. S. Sanitary Specialties Corp., Chicago, Ill., republished by registrant; for insecticides; since May 18, 1923.

436,394. Fred C. Meyer as (Meyer Chemical Co.), Sioux City, Iowa, filed Apr. 1, 1946, Serial No. 499,424; for insecticides; since Oct. 1, 1941.

473,353. Vita-Var Corp., Newark, N. J., filed Aug. 16, 1944; for waterproofing compound for wood, brick, concrete; since March 1932.

483,152. H. H. Robertson Co., Pittsburgh, Pa., filed May 9, 1945; for anti-fouling and bituminous paints; since July 17, 1919.

483,259. Commonwealth Varnish Co., Chicago, Ill., filed May 12, 1945; for ready-mixed paints and varnishes; since Jan. 23, 1945.

493,605. Klenzade Products, Inc., Beloit, Wisc., filed Dec. 20, 1945; for alkali compound for cleaning flashtype pasteurizers and heavy cleaning in industrial food plants; since Jan. 1, 1944.

493,836. Sicco Soya Paint Co., Inc., Peoria, Ill., filed Dec. 22, 1945; for paints and paint enamels in ready-mixed form; since Jan. 1, 1942.

499,344. Northrop Hendy Co., Hawthorne, Calif.; for gas turbines, axial flow compressors, fluids, accessories; since April 17, 1945.

501,747. The Linde Air Products Co., New York, N. Y., filed May 9, 1946; for abrasive powders for lapping, finishing, and polishing industrial and decorative materials; since June 1944.

503,981. Dow Corning Corp., Midland, Mich., filed June 15, 1946; for compositions in physical character comparable to milled and compounded rubber prior to vulcanization but containing organosiloxane polymers; since Nov. 18, 1944.

504,923. National Wax Co., Chicago, Ill., filed July 1, 1946; for compounded petroleum wax; since May 28, 1945.

507,845. The Resinous Products & Chemical Co., Philadelphia, Pa., filed Aug. 22, 1946; for synthetic resinous materials of the alkyd type; since Oct. 11, 1930.

507,980. General Aniline & Film Corp., New York, N. Y., filed Aug. 24, 1946; for chemical composition used as dispersing agent, wetting agent, or solvent; since July 18, 1946.

508,350. Worth Lacquer and Chemical Co., Long Island City, N. Y., assignor to Worth Lacquer and Chemical Co., Inc., New York, N. Y., filed Aug. 30, 1946; for rubberized liquid lacquer; since Oct. 20, 1944.

509,978. Early American Wax Co., New Orleans, La., filed Sept. 30, 1946; for furniture wax and polish; since January 1946.

510,218. R. T. Vanderbilt Co., Inc., New York, N. Y., filed Oct. 3, 1946; for wax emulsion for coating rubber products; since Feb. 22, 1946.

510,677. Glyco Products Co., Inc., Brooklyn, N. Y., filed Oct. 11, 1946; for emulsifying agent and wetting agent; since Apr. 10, 1946.

511,182. Edward C. Quellette, Houston, Tex., filed Oct. 19, 1946; for granular clay preparation for absorbing grease and iron on floors; since April 22, 1946.

511,772. Tykor Products, Inc., New York, N. Y., filed Oct. 30, 1946; for cleaning and grease solvent compounds; since Apr. 17, 1946.

512,185. Lion Oil Co., El Dorado, Ark., filed Nov. 7, 1946; for fertilizers; since Sept. 3, 1946.

512,990. Ridgefield Chemical Products Co., Inc., Ridgefield, N. J., filed Nov. 21, 1946; for chemical preparations for the treatment of water in boilers; since June 27, 1945.

516,416. Philip S. Hoyt, Inc., El Paso, Tex., filed Jan. 27, 1947; for composition of matter of raw or partly prepared minerals, for use as filler and insulator in plastic, paints, emulsions, rubber, oils, etc., since Oct. 1, 1946.

517,685. Advance Solvents & Chemical Corp., New York, N. Y., filed Feb. 18, 1947; for synthetic resins for industry; since July 15, 1945.

518,000. The William J. Hough Co., (Prairie Wax Co.), Chicago, Ill., filed Feb. 24, 1947; for refined and crystallized wax having petroleum origin; since Dec. 31, 1946.

518,873. Celanese Corp. of America, New York, N. Y., filed Mar. 12, 1947; for sheets, films, foils, rods, tubes, powders, and the like, capable of being molded and made in whole or in part of cellulosic plastic; since Mar. 5, 1947.

519,482. Mido Products, Torrance, Calif., filed Mar. 24, 1947; for compositions containing phosphoric acid for phosphatizing treatment of metals; since June 1, 1946.

521,435. Chrom Glo, Toledo, Ohio, filed Apr. 28, 1947; for metal polish in liquid form; since May 31, 1938.

523,022. John Powell & Co., Inc., New York, N. Y., filed May 26, 1947; for insecticides, fungicides, germicides, pesticides, and disinfectants; since Oct. 4, 1946.

525,386. Oakes & Co., Chicago, Ill., filed July 1, 1947; for ready-mixed paints, floor sealers, furniture polish, kalsomine, linseed oil; since May 22, 1947.

525,592. The J. E. Harris Co., Wooster, Ohio, filed July 2, 1947; for ready mixed paints, paint enamels, varnished and lacquers; since July 2, 1947.

526,949. Mallinckrodt Chemical Wks., St. Louis, Mo., filed July 5, 1947; for mixture applied to grass for treatment of brown patch; since Jan. 1928.

527,221. Spuck Iron & Foundry Co., St. Louis, Mo., filed July 5, 1947; for processed cast iron alloy metal; since July 5, 1947.

527,564. United States Rubber Co., New York, filed July 5, 1947; for natural rubber material for retreading; since Mar. 31, 1947.

527,736. The American Rolling Mill Co., Middletown, Ohio, filed July 5, 1947; for ferrous metals and ferrous metal castings and forgings; since July 1914.

528,025. The American Rolling Mill Co., Middletown, Ohio, filed July 5, 1947; for surface impregnated and coated iron and steel sheets; since Sept. 13, 1937.

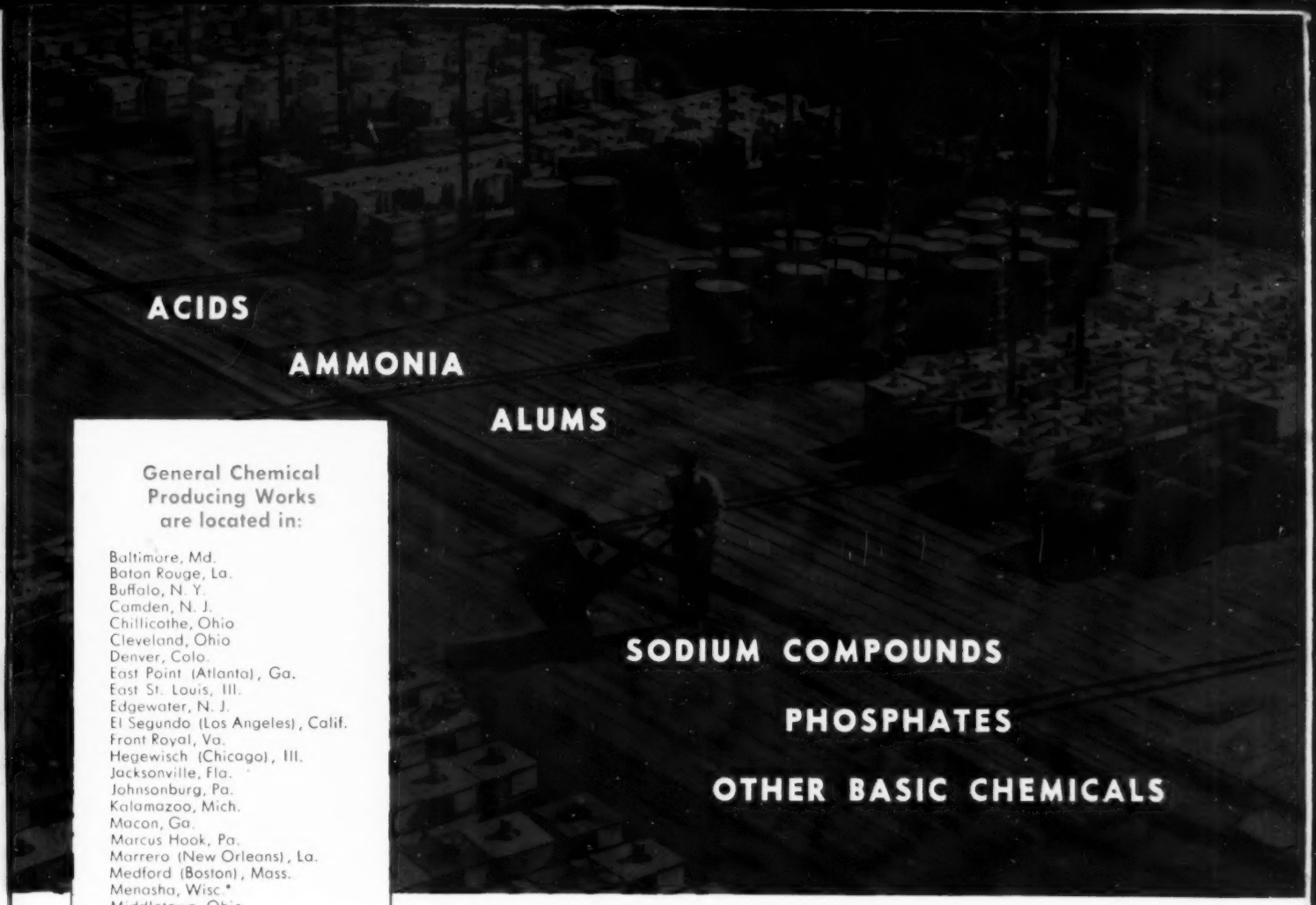
528,587. Schalk Chemical Co., Los Angeles, Calif., filed July 14, 1947; for paint brush cleaner; since Feb. 27, 1917.

528,788. C. P. Hall Co., Akron, Ohio, filed July 17, 1947; for plasticizer and softener for rubber and synthetic rubbers; since 1943.

529,809. Newville F. Rea as Getzum Products, Sumner, Wash., filed July 28, 1947; for insecticide and fungicide; since June 5, 1947.

533,432. Bupane Gas Co., Inc., Cedar Rapids, Iowa. filed July 5, 1947; for liquified petroleum gas; since Dec. 15, 1933.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office, January 20–February 17.



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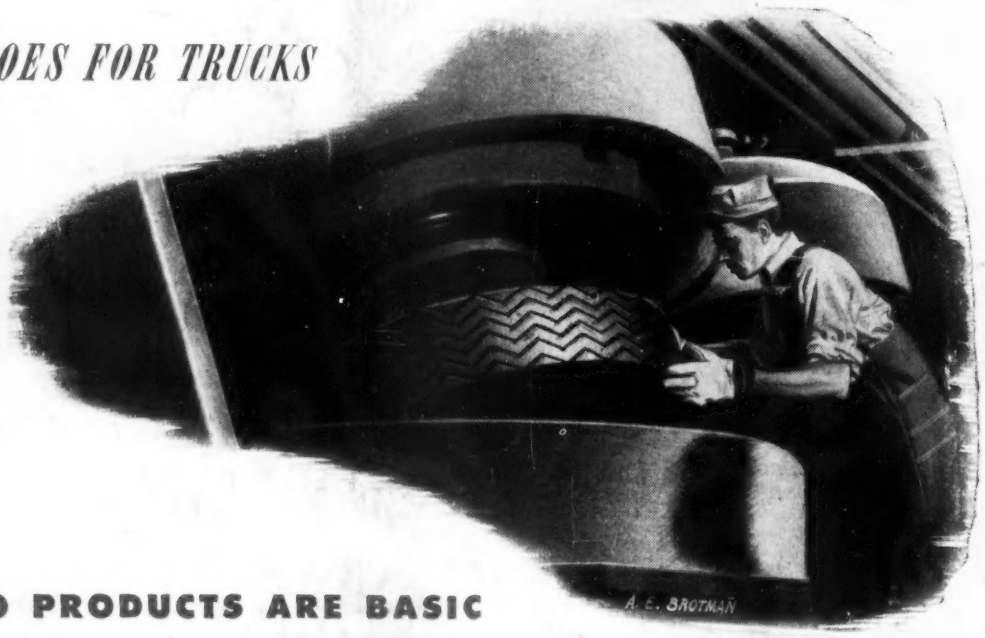

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Chemical Industries

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Chemical Industries

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